Croplife

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PRODUCTION EDITION

for Manufacturers of Chemicals for Agriculture

GRANULATING PESTICIDES—View inside granulating department of Hopkins Agricultural Chemical Co., Randolph, Wis. Operators of equipment are Ed Wendlandt and Louis Radke. Complete story on Hopkins plant begins on page 4.

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Sunlight Used in Nitrate Process

By Vincent Sauchelli
Chemical Technologist
National Plant Food Institute
Washington, D.C.

EVAPORATION PONDS—Aerial view showing arrangement of salt ponds. In foreground is the waste salts plant still under construction. Site of the evaporation ponds is in Chile.

NITROGEN in the form of crude nitrate salts occurs naturally in only a few areas of the earth's surface. Its first recognition dates from 1772 when the English chemist Rutherford demonstrated its presence in the atmosphere. The ancients were familiar not with the element, but with several of its compounds. One of these, niter or saltpetre, was known and utilized in India long before Europeans knew of it.

The Indians obtained it for commercial use by mixing wood ashes with surface soil taken from the neighborhood of stables. This soil contained workable amounts of calcium and potassium nitrates formed by the action of bacteria on decaying organic matter. The mixture was leached with water which dissolved the nitrate compounds and, through the subsequent evaporation of water, impure saltpetre crystals were formed.

Another source used by alchemists was certain porous rocks rich in potassium nitrate. Leaching them with water removed the nitrate. In China saltpetre was obtained by piling manure and organic refuse, adding lime and wood ashes and allowing the pile to "cure" after which it would be washed with water to extract the saltpetre which was used in gun-powder.

In 1809, a substance existing in the rainless districts of Chile and Peru, was found suitable as a source of nitrogen for feeding plants. It was named "Chile saltpetre" although locally the crude salt is called "salitre" or "caliche." The purified product today is known as sodium nitrate or Chilean nitrate of soda. Up to World War I this nitrate was one of the world's chief sources of fertilizer nitrogen.

The first shipment consisting of 110 tons valued at $108 per ton went to England in 1831. By 1860 the industry exported 56,000 tons and the price had dropped to $80. During World War I the price per ton jumped to $150. The Allies were completely dependent upon it since nowhere else in the world could sodium nitrate be found in commercial quantities. It was desperately needed for gunpowder.

Now let us return to the deposits and process of preparing nitrate of soda. The nitrate occurs in a layer from one to four feet under the surface, rarely deeper. This layer is locally known as "caliche" and the sodium nitrate when extracted, as "salitre." The chief problem in refining the caliche is to obtain a product as free of contaminants as is economically possible.

The mined ore ranges from small pieces up to chunks of 3 tons or more. These pieces are crushed so as to pass through a one-half inch screen. About 20% will run smaller and this fraction is processed separately; the remaining 80% coarser particles are conveyed to iron or concrete vats of some 7,000 to 12,000 tons capacity where it is leached with water or a mother liquor. The leachate comprises a strong nitrate of soda solution which is ultimately refrigerated to precipitate its sodium nitrate content as explained later.

At this point a few remarks about the fundamental chemistry may be pertinent. Sodium nitrate is much more soluble in hot water than in cold, whereas sodium chloride or common salt is only slightly more soluble in hot water than in cold. When caliche containing a mixture of these two salts is heated in water, more of the nitrate will dissolve. Hence, most of the nitrate of soda will be separated if the hot solution, poured off from the solid chloride, is cooled. The nitrate crystallizes out and if the process is repeated, practically no contaminating chloride is left and practically pure sodium nitrate is obtained. This is, briefly, the principle of the method for extracting nitrate from raw caliche.

Several processes have been developed and employed in the Chilean industry. The Shanks process using considerable hand labor and the Guggenheim process which substitutes mechanical power for most of the manual labor. The latter has been recognized as an outstanding example of modern chemical engineering, but its drawback is a high overhead cost.

The situation of nitrate of soda in current world markets is admittedly serious. Synthetic nitrogen dominates the field. Thus, nitrate of soda producers are obliged to reduce production and marketing costs. The Guggenheim process was an important development, but apparently not enough. By utilizing solar energy, might a considerable reduction in processing costs be achieved?

In 1956 the Chilean nitrate industry obtained two credits totalling $27.8 million from the U.S. export-import bank to finance equipment and services needed in its modernization and expansion programs. The board voted $16 million to the Anglo-Lautaro Nitrate Corp., the largest operator, and $11.8 million to Cia Salitrera de Tarapaca y Antofogasta (CSTA). Both companies announced a program to improve the efficiency of operations to reduce costs. Anglo-Lautaro now produces about two thirds of the nitrate while CSTA is the second largest company in this industry. Anglo-Lautaro announced at the time of the loan it intended to increase the number of solar evaporation ponds which would permit a greater recovery of nitrates from residues of the Guggenheim process.

The solar evaporation project designed for the recovery of potash-nitrate, additional sodium nitrate and other chemical by-products is both an advance and complement to the Guggenheim process. It enables other values usually wasted in plant tailings to be extracted by a second leaching and recovered by precipitation and crystallization. Solar energy will be utilized to concentrate the secondary leachings. Ultimately, solar evaporation may be utilized also for the treatment of extremely low-grade ores and material previously discarded as waste.

Solar evaporation is not entirely a new process; it is used, for example, in extracting common salt from sea water. For this purpose, large clay beds are an asset. In Chile such large clay beds are not available on the nitrate pampa. Leak-proof, evaporating pond areas must be built. Just how to build leak-proof ponds has posed a problem. A suitable combination of cheap materials for pond-making comes from a mixture of equal parts of "ripio" and crushed stone to which 3% of lime is added. (Ripio is the material left in the vat and filter press from the nitrate leachings.) The brine or nitrate leachings contain some magnesium and sodium sulfate. When this brine enters the pond these sulfates react with the lime in the mixture to form a light flocculent precipitate of magnesium hydroxide and a double salt, calcium-sodium sulfate, which fill the voids in the mix and seal off the surface to make the pond practically leak-proof.

The mother liquor used for leaching caliche is saturated with other salts such as potassium, borates, sulfates and chlorides present in the original ore. These chemicals have not been extracted in the leaching operation and have been discarded as waste in the plant tailings. It is now contemplated to recover them in a secondary leaching since they are all practically soluble in water. They are not soluble in the mother liquor used in the primary leaching of the caliche.

The proposed secondary leaching with water produces a weak salt solution. Recovery of dissolved salts is not usually economical, but if the brine could first be concentrated by low-cost evaporation, it might pay to recover them. This is what has happened. Years of research have devel-

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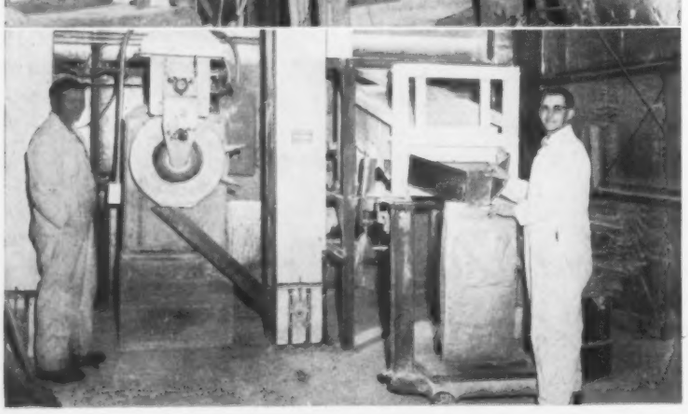
Hopkins Firm Operates Modern, Efficient Pesticide Facility



THE HOPKINS Agricultural Chemical Co. was organized in 1949 by James D. Hopkins for the sole purpose of formulating insecticidal dust for the canning trade in Wisconsin, Minnesota, Iowa and Illinois. The plant site at Randolph, Wis., was chosen because of its strategic location in an area where vegetable canning operations were concentrated. Madison was chosen as the business office headquarters of the concern.

From this rather inauspicious start the company has developed, in the ensuing ten years, to become a leading formulator of both liquid and dust type insecticides, fungicides and rodenticides. By intent the company has ruled out the formulating of herbicides from its program. Mr. Hopkins states that he does not believe that herbicides could be handled without the danger of contaminating their other products. They do, however, job a line of herbicides produced by another manufacturer.

Hopkins products are marketed through dealers and jobbers throughout the Midwest.

In addition to the marketing and production of products under the Hopkins label the company devotes a large part of its capacity to custom formulating insecticidal dust, liquids and rodenticides for many other organizations. They're also well equipped to package under private label arrangements.

Mr. Hopkins is president of the company, Wils Mowry, sales manager and James Dueppen, office manager. Robert Stemmler is the production manager at the Randolph plant and he is assisted by Robert Risley and Melvin Adams.

Lynn K. Brunn has recently joined the firm as technical service manager. He was formerly associated with Atlas Powder Co. in agricultural marketing activities and prior to that was with the Sherwin-Williams Co. as an entomologist. He has degrees in chemistry and entomology from South Dakota State College and the University of Wisconsin.

Before Mr. Hopkins set up his original dust plant at Randolph in 1949, he and Robert Stemmler, produc-

tion plant manager, visited other plants in various states, then came back and designed their own production unit. They were aided by Dr. William Lea and Edward J. Otterson of the Wisconsin State Department of Hygiene, in modeling a plant which met required safety standards.

Early in 1950 when parathion was found to be effective in insect control, especially for pea aphids, Mr. Hopkins decided to enlarge his plant for the formulation of organic phosphates. Again he was assisted by the Wisconsin State Department of Hygiene, and also by the American Cyanamid Co. William R. Bradley of that company worked out control measures for ventilation, which resulted in the Hopkins plant being cited by many industrial experts as one of the safest in the handling of such toxic materials.

At the time the redesigned plant was completed, newspapers in the area featured many of the safety measures photographically and described the operations in detail.

In 1951, and with the rapidly-increasing demand for organic phosphate insecticides, Mr. Hopkins became concerned about the safety of field personnel who work with these products and again called upon the Wisconsin Department of Industrial Hygiene and the American Cyanamid Co. for assistance in establishing hospital laboratories trained in the determination of cholinesterase levels, a method used to determine the extent to which personnel may have been exposed to the organic phosphates. Many laboratory technicians were trained by both the Wisconsin State Department of Hygiene and trained personnel of the American Cyanamid Co.

Another addition to the Hopkins line was introduced in 1951 when the formulation of Warfarin rodent bait was begun. This bait is formulated in an isolated building, so that there is no possibility of contamination. Rats are very sensitive to "off" taste and odors, and an isolated building is considered essential to the best formulation of the product.

In producing Warfarin, the Hopkins firm uses a 1,000 lb. capacity Marion mixer and two California pellet mills. Each mill can produce 1,200 lb. an hour of Warfarin pellets. The plant has a production capacity of a carload of Warfarin daily, either in meal or pellet form.

Much of the Warfarin is formulated under the Hopkins label, but custom and private label production requires a great deal of the plant's capacity. Such production gives the Hopkins firm national distribution on Warfarin products.

College and university personnel, as well as others interested in rodenticides, visit the Hopkins plant frequently to witness the formation of the product in this carefully supervised isolated building.

The company's basic building is 100 by 100 ft. single level, with an

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A LOOK INSIDE PLANT—Top photo, page 4: Interior of warehouse at Hopkins Agricultural Chemical Co. plant, Randolph, Wis. Second shot, Melvin Adams, assistant manager, checks one of two pellet mills in isolated Warfarin formulation plant. Third picture shows mobile hoist transporting bags in formulation plant. Across bottom are Eugene Wallintin at the pellet mill, and Eldon Posthuma at the grader. At lower right is Robert J. Risley, assistant manager, in the company laboratory. At the top of this page are Wils Mowry, sales manager; Lynn K. Brunn, technical service manager; and James D. Hopkins, president.

Wils Mowry

Lynn K. Brunn

James D. Hopkins

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Formulation of Herbicide Key to How Well It Performs in Field

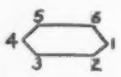
By Philip H. Marvin
Robert S. Wise, Inc.
Topeka, Kansas

BY MIXING products from petroleum oil, table salt and vinegar, a chemist could, theoretically, produce 2,4-D, and other hormone herbicides. Benzene, which serves as a basis for 2,4-D and other pesticides, is a fraction of petroleum oil as are kerosene and gasoline. Chlorine, another common part of many pesticides, frequently is obtained from salt, sodium chloride. A part of 2,4-D is acetic acid, the compound which makes vinegar sour.

This article attempts to present some phases of the chemistry and formulations of phenoxy acid types of herbicides, including 2,4-D and 2,4,5-T.

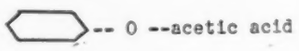
Chemical language and symbols sometimes require clarification. H_2O, of course, is readily recognized as water—a combination of hydrogen (H) and oxygen (O). Sodium (Na) and chlorine (Cl) join to make sodium chloride (NaCl), commonly known as table salt. Just as simple to the petroleum chemist is this six sided benzene ring:

For convenience, it is called a phenol ring in this article. Each point on this phenol ring is designated with a number, thusly:

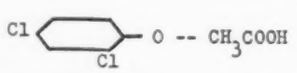


The herbicide name 2,4-D is an abbreviation of the chemical name of 2,4 - dichloro phenoxy acetic acid. The dichloro indicates 2 chlorines attached to the 2 and 4 positions of the phenol ring:

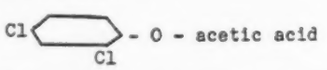
Phenoxy acetic acid indicates that acetic acid (CH_3COOH) is attached to the phenol ring with oxygen as the connecting unit:



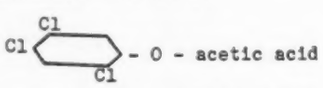
Thus, 2,4-D=



or more popularly,



2,4,5-T serves as an abbreviation of 2,4,5-tri (or 3) chloro phenoxy acetic acid, the three chlorine in positions 2,4 and 5, thusly:



The herbicides manufactured by combining chlorine atoms and acetic acids to the benzene (phenol) ring first become crystalline in form, similar in appearance to sugar. The 2,4-D crystals dissolve in other petroleum products, but not in water. The crystals may be ground up to produce dusts, they may be ground very fine and mixed with water to form pastes, or they may be dissolved in special solvents and formulated into sprays.

Since dust formulations are hazardous if allowed to drift to adjacent susceptible crops, such formulations of 2,4-D are not permitted in some states. Pellet or granular forms of 2,4-D have been effective in many experimental tests, but not for general usage as yet.

Paste forms of 2,4-D greatly reduce drift hazards and are non-volatile. They have special usage to control weeds about crops and ornamentals which would be affected by 2,4-D. Applications are made close to the ground.

The great majority of 2,4-D usage is through sprays, with either amine or ester formulations. The amine salt is made by adding ammonia to the manufactured 2,4-D. The ester form results from combining 2,4-D acid crystals with an alcohol.

Both the amine and ester formulations were produced by adding chemicals to the original 2,4-D acetic acid. The amine becomes a salt-like material, about four fifths of which is the original 2,4-D acid and one fifth the ammonia compound. The label will show 49.4% amine salt content of a 4 lb. 2,4-D amine, and only 41% represents the 4 lb. acid equivalent.

Comparing the amine and ester formulations further, the amine form of 2,4-D is produced as a salt which dissolves in water but does not mix readily with petroleum products. The ester form retains the non-solubility in water as found in the parent petroleum-like material. Esters do mix with petroleum products, however.

Ester formulations, including low volatile esters, require an emulsifier to mix with water for spraying. The emulsifier serves as a bond or connecting link between the petroleum-like 2,4-D esters and the water used as the carrier.

Since different types of water react variously to the petroleum materials as well as to the emulsifiers, at least two different emulsifiers are used by many formulators to give the product a wider range of effectiveness over various waters and spraying conditions.

Some of the most desirable properties of herbicidal products for control of weeds in large sections of the U.S. include their quick emulsifying; their ability to remain well emulsified even when not being agitated; and the property of releasing the toxicant quickly after spraying, so the chemical may enter the plant without delay.

Formulators are of course sharply concerned with competition. Lower costs of production are a prime consideration, but it is not always possible to compromise with product quality and at the same time maintain the confidence of the user. The employment of lower-cost solvents, for instance, may result in more sediment in the bottoms of spray tanks. Less-efficient emulsifiers may make it necessary for constant agitation to keep the product well mixed. Even though the acid equivalent may be equal between two products, one may be inferior to the other because of the types of solvents used.

Volatility of 2,4-D esters is well known, making possible spray drift. This property is caused partly because of finer-sized droplets produced by ester sprays as compared to amine sprays. But sometimes applicators themselves are at least partly responsible for small droplet size through use of high pressures with small nozzle openings. Drifting spray of this type affects susceptible plants for a greater distance than does volatility drift.

Upon application, ester formulations give quicker responses than do amine. In part, this is due to faster penetration into the plants. As used in the field, esters are more effective, pound for pound, than are amines. However, critical tests have shown that once within the plant, the amines match the esters in effectiveness.

With the formulation of herbicides lies the secret of their final quality. Other things being equal from the standpoint of materials used, the skill, finesse and knowledge employed in formulating the product make the difference between excellence and mediocrity.

Chemical Employment Rises in California

SAN FRANCISCO—Chemical manufacturing plants continued their recovery during February, and for the first time in many months employment increased above the corresponding month for the previous year.

The number of wage and salary workers involved in chemical production in California increased to 37,800 in February, which figure compares with 37,300 in February of 1958. A rise of 400 in estimated employment from the January figure of 37,400 reverses the last January to February movement, which was down from 37,500 to 37,300.

The production worker segment of the industry maintained about the same average weekly earnings as during January, but had improved some 6% over the previous February. Earnings were estimated at $102.09 per week, as compared with $102.66 the month before, and $96.72 a year before. Average hourly earnings for the three months were, respectively, $2.49, $2.51 and $2.40.

Nitrogen Division Changes Name, Color of Uran

NEW YORK — Nitrogen Division, Allied Chemical Corp., has changed the color and the name of its Uran nitrogen solution. The product, in all of its grades, is now golden colored rather than clear and is named Golden Uran.

The changes were made, Nitrogen Division announced, so that Golden Uran "could be readily identified and not be confused with other urea-ammonium nitrate solutions made by other companies."

Except for the new color, no changes have been made in the product itself, Nitrogen Division said.

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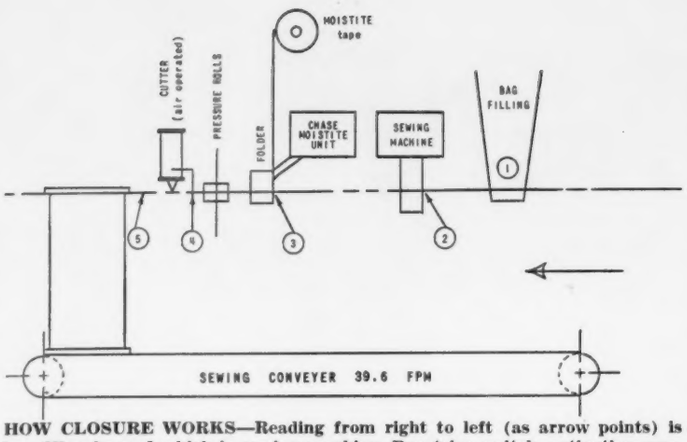
MOISTURE-PROOF packaging of hygroscopic products where humidity and damp storage conditions are a factor, continues to pose a problem for the manufacturer of fertilizers and pesticides. This is particularly true where ammonium nitrate, ammonium sulfate and other moisture-absorbing products are concerned.

A method has been devised by Chase Bag Co. whereby multiwall paper bags may be moisture sealed at both ends. Company spokesmen say that through the use of a special tape, adhesive and method of application, fertilizer manufacturers may moisture-seal bags at the filling end.

The tape, according to Chase, gives a perfect bond even when dust particles may cling to the tape. Once applied, it is nearly impossible to tear the closure off a bag without pulling part of the outer ply of the bag with it, Chase says. It is also pointed out that the method seals the closure from tape end to tape end, firmly sealing the ends extending beyond the bag.

The closures apply at "such speed that heat will not scorch the paper nor melt a poly-coated inner sheet," a spokesman said. "The faster it is applied, the better the sealer operates. No reduction in bag filling speed is required. Airborne moisture does not penetrate the needle holes."

Other advantages claimed for the moisture-proof closure include easy installation in a plant and less waste because of longer shelf life.



HOW CLOSURE WORKS—Reading from right to left (as arrow points) is bag filler, beyond which is sewing machine. Bag trips switch, activating sewing unit and tape unit. Adhesive is applied to the tape just before folder. Bag trips cutter to trim excess tape front and back. Another switch shuts down sewing machine as bag moves to end of belt.

Sohigro® UREA gives fertilizer sales a real growth boost

INDUSTRY figures for the 12 North Central States show a 30% boost in the use of nitrogen in fertilizer materials with an increase in higher nitrogen complete fertilizers — 1-1-1, 2-1-1 and even 3-1-1 ratios — during the past year. But if mixed fertilizers don't supply all the nitrogen your customers need, meet the demand by stocking Sohigro Urea. Sohigro Urea supplements mixed fertilizer sales with profits from plow down, top dress, or side-dress sales.

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8-59

Fertilizer Safety Contest Results Announced

CHICAGO—Perfect safety records were achieved by 79 fertilizer plants competing in the safety contest sponsored by the National Safety Council, according to an announcement by NSC. Some 170 contestants were involved in the year-long contest which ran from Jan. 1, 1958 to Jan. 31, 1958. Total manhours worked came to 27,749,000, the report states.

Statistics released by NSC indicated that manhours worked in 1958 decreased 5% from the mark of 1957; there were 247 injuries which lowered the 1957 figure by 23%. The decrease in the final rate of accidents in plants, compared to 1957, was 19%.

Best plant marks were made by wet mix units which decreased their rate by 28%. Fertilizer plants made a 14% better record, but dry mix units tallied a 5% increase in accidents. The over-all reduction in accidents was 19%.

PLANT

Continued from page 5

adjunct 40 by 80 ft. two story level building. Last year an additional 60 by 70 ft. building was erected for manufacturing and warehousing.

In 1958 the company installed equipment for production of granular insecticide products, since there is a growing demand for this new type of formulation.

In addition to the carload of Warfarin that can be produced daily, the new equipment enables the firm to produce three carloads of dust insecticides daily. Liquid capacity is about 5,000 gallons a day.

A third pellet mill has recently been installed in the insecticide formulating building. This mill is used solely for the purpose of producing pelleted insecticides and has a capacity of approximately 2,500 lb. pellets an hour.

The company does a great deal of educational work for dealers, jobbers and canners, assisting dealers in arranging meetings in various territories to disseminate information about its products and their use in producing better crops.

A canners field day at Randolph is an annual event conducted for about 200 industry field men. Entomologists and others trained in crop sciences discuss problems with the canners' representatives.

The plant itself is isolated, situated a quarter mile from any other structure, and the firm owns sufficient land to retain this ratio in future expansion programs.

Beautiful specimen of Nature's handiwork: Sulphur Crystal embedded in the matrix of limestone and calcite crystals recovered from a drill core taken hundreds of feet underground while exploring a Sulphur deposit. (Ektachrome by Keturah Blakely)

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Solid Sulphur by Rail, Barge, or Ship

Molten Sulphur by Rail, Truck or Barge, from Mines or Strategically Located Terminals

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SULPHUR

from left to right:
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Loading Barges with Molten Sulphur
Loading Freighters with Solid Sulphur

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Fertilizer Processing Study Launched by Texas Co., Purdue

L. C. Kemp, Jr.

A NEW approach toward development of fertilizer manufacturing techniques based on agronomic needs is being carried out jointly by The Texas Company and the Purdue University Research Foundation. The program will take a new direction with the university's department of chemical engineering developing process methods for making plant food materials with the desirable features suggested by the department of agronomy. The department of biochemistry will analyze the fertilizer for its compliance with nutrient content and agronomists will later test the new plant food for its performance in crop production.

The University staff will be headed by Dr. Lyle Albright, chemical engineering department of Purdue. Dr. J. B. Peterson, department of agronomy and Dr. F. W. Quackenbush, state chemist, will work with Dr. Albright in the program. Dr. C. Loyal W. Swanson, research and technical department of The Texas Company, Chicago, will direct the project.

In commenting on the project, L. C. Kemp, Jr., vice president of Texaco's petrochemical department, told Croplife that more intensive studies of fertilizer manufacturing techniques by industry are not only desirable, but mandatory.

"To date fertilizers have been tested mostly from the standpoint of their effects on plants and upon yields with less emphasis on how to make better materials. In a highly competitive industry, obsolete processes become uneconomical and new ways to produce become imperative."

"Some excellent work has been done in this field by the Tennessee Valley Authority," he said, "but we believe that much more must be done by industry.

"We are particularly impressed by the possibilities offered in the closely coordinated approach of the chemical engineering and agronomy groups to be employed in the new Purdue University Research Foundation project. In addition to providing fundamental information on fertilizer compositions and their effectiveness, the program should result in the development of new commercial manufacturing methods and products."

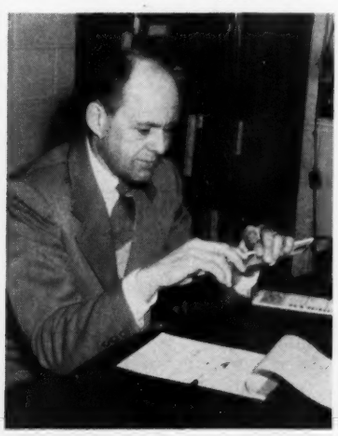
Dr. Swanson expressed similar enthusiasm for the project. He said that two basic things are needed in order to increase consumption of fertilizer which agronomists indicate can be done economically.

"We need a wider and more intensive educational program on the use of fertilizer directed to the farmer and we need the development of more efficient fertilizers that are easier to handle and to apply. We believe that the current research project of Texaco and Purdue University will make some very important contributions in meeting this latter need," he commented.

At the university, a talk with Dr. Albright underlined the philosophies expressed by Mr. Kemp and Dr. Swanson. "Take one problem . . . that of ammoniation," Dr. Albright said. "There really has been no effective and foolproof way to tie together all of the variables involved, so there are many unanswered questions concerning this phase of fertilizer manufacturing. Some of these variables are involved with temperature, ammonia partial pressure, contact, or reaction time. It is necessary to control each one of these variables carefully and accurately in order to arrive at the kind of information needed for this type of program.

"Other phases of our work will lie in studying particle sizes," he went on. "It is essential to keep these particles small in order to effect com-

Turn to **PROCESS STUDY** page 14



Dr. Lyle Albright

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Pesticide Plant Personnel Urged to Note Safety Rules

HANDLING of organic phosphate insecticides, as well as all other types of toxicants, must be done with both knowledge and respect. Dr. T. T. Bell, deputy county health officer in charge of agricultural pesticides, Watsonville, Cal., has given some good words of advice, as carried in a recent issue of "Crop Comments," published by Arizona Fertilizers, Inc., Phoenix.

Here is the gist of Dr. Bell's comments:

Organic phosphate insecticides include: Parathion, Systox, Phosdrin insecticide, Metacide and others. New preparations are being brought on the market all the time. In using any of these materials, it is important only to remember that the effect on you is the same, regardless of which preparation is used.

These "poisons" are in the form of either dusts or sprays and reach your body directly by breathing the insecticide — or, more important, they may be absorbed through the skin. This is why you are told to wear protective clothing and a mask. Any dust or spray left on the skin will continue to be absorbed through the skin. This is why employees are told to change clothes and bathe immediately after working with these materials. Do not forget to wash hair carefully if no headgear was worn while on the job. Any dust residue or spray dried on clothing may get into the skin next time the same clothing is worn. This is why clean clothes must be worn each day.

As the "poison" first enters one's body, you feel perfectly well, for each person has an "antidote" within the body. However, for every bit of poison that enters the body, some of that "antidote" is used up. For every bit of that "antidote" used up, it takes the body from three to four weeks to make up the amount used.

Therefore, if you forget or neglect to wear protective clothing and bathe after each day's work, the natural "antidote" present in your body will be used up more rapidly than the body can replenish it. Only when the "antidote" has dropped to about one-half of what is normal for you, will you feel sick. By this time the amount of "antidote" present is dangerously low—and death might easily follow. Whether you are exposed to the same insecticide day after day or a different one each day makes no difference, since the phosphate compounds accumulate in the body and will use up the "antidote" in your system.

The "spray test" used in the laboratory measures the amount of "antidote" in the body of the person tested. If the amount of the antidote is known before operations are started for the season, a further check during the season will tell how well you are protecting yourself by the precautions you have used. If you have been careful there will be little drop in the amount of antidote present in your system. If you have not been careful and a test shows a considerable drop in the antidote, it gives you warning before you get sick or endanger your life.

Agricultural chemical makers show one of the finest safety records of any industry. This record will be preserved if all pesticide handlers will follow safety instructions.

Three Firms Join in Offering Urea Process

NEW YORK — Three companies representing three stages in the life of a chemical: process development, plant engineering and construction and production have entered an arrangement for the future sale of a proven process to make urea.

Pechiney of France who pioneered the total recycle process by making urea from ammonia and carbon dioxide using a neutral oil slurry to recycle unconverted raw material will license its original rights through the Foster Wheeler Corp. The process will be commercially augmented by joining with W. R. Grace & Co.

The new arrangement will benefit companies interested in making a urea of high purity and low biuret content for fertilizers, animal feed and industrial uses.

Known as the Pechiney-Grace process, the method will incorporate recent advances in urea production and quality control developed at Grace Chemical Division's Memphis plant, the spokesman said.

According to the company, Grace engineers have simplified the basic synthesis design; experimented and developed modifications to the system; improved evaporation and prilling techniques and added new purification and ammonia recovery systems. Currently, Grace with the assistance of Foster Wheeler is doubling the capacity of its 150-ton-per-day plant and will be on stream with its new operation by early summer.

Grace, at the option of the customers who acquire the Pechiney-Grace process will also consider negotiating a separate agreement on a fee basis to train customers' personnel at its Memphis plant. On this basis, Grace will also supply any special services desired such as furnishing its own production engineers to assist during start-up operations for future customers, the spokesman said.

New Asst. Superintendent

NEW YORK—M. B. Steele, general foreman at Agrico's Saginaw, Mich., manufacturing plant, has been named assistant superintendent at Washington C. H., Ohio, according to an announcement by D. S. Parham, vice president in charge of production for the American Agricultural Chemical Co. A. F. Vetter is superintendent at Washington C. H.

Engineer Named

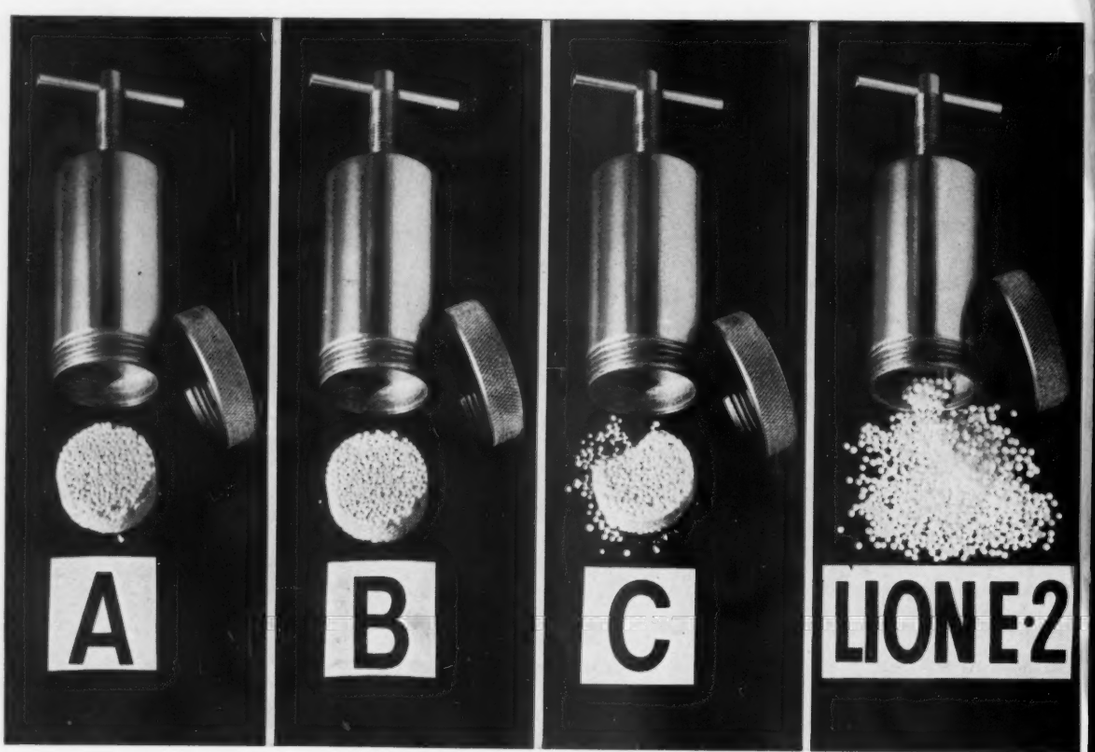
MISHAWAKA, IND. — Harold F. Schulte has been appointed chief engineer of Wheelabrator Corp., Mishawaka, Ind., J. F. Connaughton, president of the firm, has announced.

Mr. Schulte, with Wheelabrator Corp. since 1940, has been acting chief engineer since April 1958. He previously held positions in the sales, service and engineering departments of the company which manufactures dust and fume control equipment.

A 1940 mechanical engineering graduate of Purdue University, Mr. Schulte also is a registered professional engineer in Indiana.

It's a fact: Monsanto's new fertilizer discovery acts like "profit insurance" for you!

ONLY NEW LION E-2* ENDS



COMPRESSION CHAMBER TESTS PROVE NO OTHER AMMONIUM NITRATE CAN MATCH NEW LION E-2 FOR NO-CAKE, DUST-FREE PERFORMANCE

No more customer complaints, costly returns, double handling or extra bookkeeping when you sell new Lion E-2 no-cake ammonium nitrate fertilizer. Here's the whole profit story.

New Lion E-2 is the first truly non-caking ammonium nitrate. Lion E-2 was developed by Monsanto scientists seeking to end one of the major problems plaguing you and your customers: fertilizer caking. Tested in the field under all extremes of temperature and humidity, Lion E-2 just wouldn't cake.

New Lion E-2 won't gum up, clog or bridge in your customer's spreader. The uniform prills are 50% harder . . . free of irritating dust and fines. They won't break down, crumble or cake either in shipment or storage.

New Lion E-2 takes 20% less of your storage space because it's super-dense. It has the greatest density of any ammonium nitrate made today. Lion E-2 saves your time, storage space, and makes your handling job easier.

New Lion E-2 lengthens your selling season because it's storage-stable. It is not readily affected by temperature changes or humidity. Your customers can buy any time and store safely until used. LION E-2 may well prove your big *year-round* volume builder!

Lion E-2 is guaranteed not to cake in the bag in your place or on your customers' farms. From all angles, Lion E-2 is the superior-quality ammonium nitrate . . . yet it sells at ordinary ammonium nitrate prices. Sell your customers the best . . . you'll keep old customers coming back and gain many more new ones who want the best: new Lion E-2.

PRODUCTION

Man of the Month

J. D. Price Looks Back Over Half Century in Fertilizer Industry

A LIFETIME of experience in the chemical field forms the background for the fertilizer production activities of J. D. Price, superintendent of the by-product coke plant of Colorado Fuel and Iron Corp., Pueblo, Colo. His career began nearly 50 years ago in the coke manufacturing business at Gary, Ind. He joined C. F. & I. in 1917 and served in various engineering positions before becoming superintendent of the coke and coal chemicals department in 1924.

Mr. Price describes his fertilizer activities by reminding that most by-product coke plants recover the ammonia from coke oven gas in one form or another, with the majority making ammonium sulfate. "We followed this practice for a great many years," he says. "However, early in 1950, it became increasingly evident that some other form of ammonia recovery might be more desirable due to the lowered market value of ammonium sulfate.

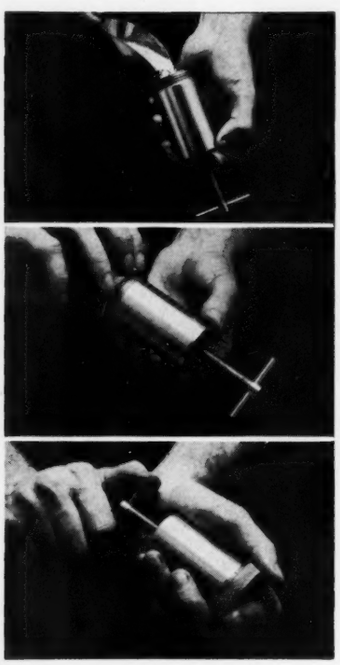
"Following a period of experimentation, we started production of another and more complete fertilizer material—diammonium phosphate. We were the first coke plant in the U.S. to do this. Another innovation at our plant was the installation of an Allis-Chalmers compactor for production of diammonium phosphate in granular form. In this compactor the small crystals of DAP are compressed into thin flakes which are later cut in granulating rolls to give a product of the desired size and shape.

"We recover about 22 lb. DAP per ton of coal carbonized in our coke ovens, or about 1 ton of fertilizer for every 90 tons of coal charged. In the operation of our coke plant, about 350 men are required, so our production rate of finished fertilizer is not much on a per-man basis; however, it must be remembered that the ammonia products are only a by-product with us and not the primary product itself."

Mr. Price's knowledge of the iron and steel industry has led him into interesting by-ways since World War II. During these years he has served the United Nations in two positions. In the first, he was sent to Mexico as a member of a commission to study that country's iron and steel industry with the specific assignment to observe coal mining and preparation and coking practices. The second position was that of an observer and participant in meetings in South America where several weeks were spent discussing the steel industry of that continent.

J. D. Price

CAKING PROBLEMS FOR GOOD!



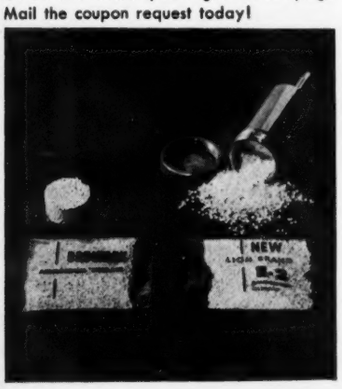
HOW TESTS WERE MADE . . .

1. Steel compression chamber is filled with prilled ammonium nitrate.

2. Steel cap closes chamber.

3. Pressure up to 600 lbs. per sq. inch is applied by turning T-bar.

4. See Lion E-2 tested in your own store . . . compare results with any other ammonium nitrate you might be carrying. Mail the coupon request today!



CONVINCING ADVERTISING AND STORE PROMOTION NOW BUILDING FARMER INTEREST IN LION E-2

Eye-catching, hard-selling advertisements in FARM JOURNAL, CAPPER'S FARMER, PROGRESSIVE FARMER, FARM AND RANCH are backed up by state farm publications, local county newspapers. Your customers will be reading about, asking about Lion E-2. **Colorful Promotional Aids Hike Volume.** Window and wall banners . . . facsimile bag cutouts to hang from the ceiling . . . full-color framed bulletin board . . . literature and sample dispenser for your counter . . . ad mats for your local use . . . all designed to help you do a bang-up sales job on new Lion E-2.

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Inorganic Chemicals Division
Dept. CL-P, St. Louis 66, Missouri

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☐ I would like to see Lion E-2 demonstration
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Hercules Officers Reelected At Firm's Annual Meeting

WILMINGTON, DEL. — Directors of Hercules Powder Co. at their annual reorganization meeting reelected all officers of the company as follows: Albert E. Forster, president and chairman of the board; Wyly M. Billing, John J. B. Fulenwider, John R. L. Johnson, Jr., Paul Mayfield, Edward B. Morrow, vice presidents; J. H. Tyler McConnell, secretary, and John E. Goodman, treasurer.

The directors also reelected the executive committee consisting of: Mr. Forster, chairman; Mr. Billing, Mr. Fulenwider, Mr. Johnson, Mr. Mayfield and Mr. Morrow.

Reelected to the finance committee were: Mr. Morrow, chairman; Mr. Forster, Mr. Goodman and Mr. Johnson, Jr. Mr. McConnell was elected as a new member of the finance committee.

The board declared a regular quarterly dividend of 1¼%, equal to $1.25 a share, on its preferred stock, payable May 15, 1959, to stockholders of record May 1, 1959.

New Guano Distributor

EL PASO, TEXAS—Texneva, Inc., of El Paso has announced its U.S. distributorship of bat guano from a Mexican deposit. The firm says that the material, from 10% to 13% available nitrogen, will be screened in Juarez, Mexico, then shipped to the company's plant in El Paso where it will be blended and put up in 80-lb. bags.

The organization plans to sell the material in carload lots to fertilizer manufacturers in the U.S. R. G. Ponsford, Jr., is in charge of production, machinery and equipment. The plant is expected to be ready for initial shipments by May 1, Mr. Ponsford says.

TURN BACK

To page 4 if you are interested in a picture tour through the Hopkins Agricultural Chemical Co. plant in Wisconsin.

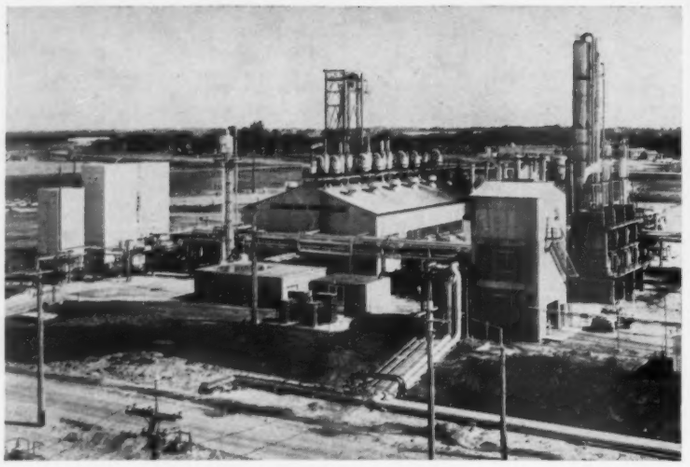
PROCESS STUDY

Continued from page 11

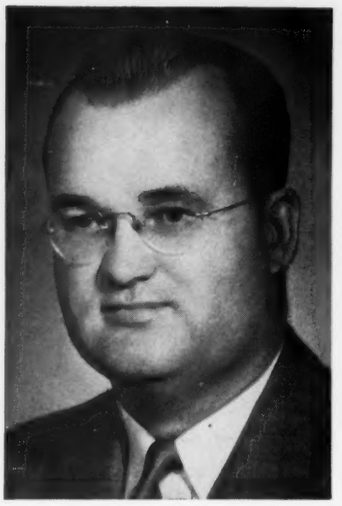
plete ammoniation and not allow the interior of larger particles to be untouched by the process. We, in addition, place a considerable amount of importance on crystal structure of the final ammoniated fertilizer," he said.

Dr. Albright summed up his remarks by stating that every effort will be made to control variables mentioned above in order to determine exactly the effects of temperature and ammonia partial pressure in the ammoniation process.

The first phase of the research program is expected to require most of the first year of the study. This work will center around the department of chemical and metallurgical engineering and the departments of agronomy and biochemistry.

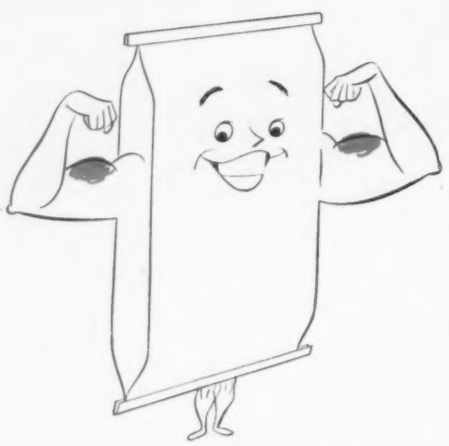


PRODUCTION FACILITIES—Anhydrous ammonia plant of Texas Company at Lockport, Ill., produced nitrogen fertilizer materials such as will be used in testing new mixed fertilizer manufacturing processes by Purdue University.

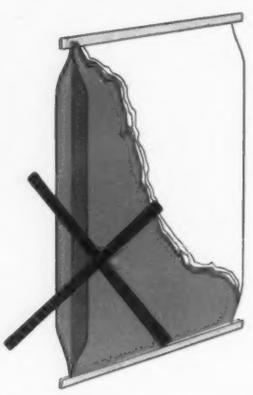


Dr. C. L. W. Swanson

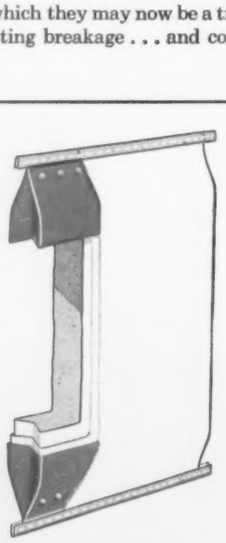
Need a little added bag muscle? Bemis Strength-End Multiwalls give it ...*ECONOMICALLY*



Could your multiwalls use a little more muscle on jobs for which they may now be a trifle light? Are you getting breakage . . . and complaints?



There's no need to add a whole ply to your multiwalls and boost your cost appreciably. You can save money . . . and get the strength you need . . . by using job-tested Bemis Strength-End Multiwalls, with added strength top and bottom, where most sewn-bag breakage occurs.



Or maybe your problem is that you're somewhat OVERpackaged. You could eliminate a full ply and, in its place, use Strength-End protection. And save *that* way.

Bemis Strength-End Multiwalls have been successfully used in all sections of the country and under all climatic conditions.

Ask your Bemis Man for the complete story . . . and examine the bag yourself. You'll quickly see its common-sense, balanced-strength construction . . . the solution to many problems of underpackaging and overpackaging.

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Maintaining Grade Poses Problem in Fertilizer Plants

Maintaining the grade with high-analysis dry mixed fertilizer materials is frequently a problem. Many manufacturers experience difficulty in preventing reduction in grade after the materials have been mixed.

A recent attempt on the part of Tennessee Valley Authority fertilizer experts to find answers to these problems resulted in some helpful observations:

1. The major ingredients of any particular dry mix should be of the same approximate particle size to minimize segregation. Powdery mixes should not be stored for long periods of time.
2. A maximum mixing time of 30 to 40 seconds should be used in dry mixing, particularly where a change in particle size might take place.
3. Dry mixes have no shrinkage as do mixtures produced using solution; therefore, more care must be exercised in maintaining grade. Dry mixes may absorb small amounts of moisture, thus reducing grade.
4. An overage should be used in all hi-analysis mixtures; 0.2 unit for each constituent is close to a minimum figure where sizes of the major ingredients are compatible and good mixing is obtained. In some grades a larger overage may be required. Quackenbush and Miles of Purdue University have a publication on recommended overages for various grades.
5. Diammonium phosphate and superphosphate should not be premixed for long periods of time prior to use in batch or continuous processes with nitrogen solutions. No harm is done in dry mixes except perhaps some effect on physical condition of the mix. If a mixture containing diammonium phosphate and superphosphate is blended prior to ammoniation, however, the amount of ammonia that the superphosphate will take up will be reduced by the amount of ammonia the superphosphate may have absorbed from the diammonium phosphate.
6. Producers should send the actual analysis of materials shipped to the user. When possible, mixers should have analyses made on all sizable shipments of raw materials, particularly if any difficulty arises in maintaining grade in the initial use of these materials.
7. Frequent checks should be made on all weighing equipment used in fertilizer manufacture.

Arcadian® News

Volume 4 | For Manufacturers of Mixed Fertilizers | Number 3

HOW TO TAKE THE PANIC OUT OF PRODUCTION!

SUGGESTIONS TO HELP YOU:

- *Get tonnage out on time*
- *Hold the analysis*
- *Maintain top condition*

Making mixed fertilizer efficiently takes: a) thorough preparation, b) carefully supervised production. Invariably, the most successful producers are those who operate in accordance with these two basic principles—whether they make pulverized or granulated fertilizer.

Getting the Tonnage Out

One of the main reasons for inability to maintain tonnage schedules is "taking too long" to start up and shut down production. Producers should strive to come as close as possible to simultaneous operation of all controls that directly affect the processing of the product.

Another obstacle to getting tonnage out is *fluctuating* recycle. In fact, many tons per day can be added to the production pile by taking corrective measures at the first sign of fluctuation. For if fluctuations are allowed to continue, they usually lead to *uncontrolled* recycle, and the radical adjustments that can destroy the quality and quantity of production. If uncontrolled recycle develops it is wisest to dump some material rather than spend the day fighting the problem. However, be sure there is no change on analysis if much of any segment of the production is taken from the flow.

It is amazing how some producers will continue to lose tonnage simply because of inadequate equipment. For example, some operations have flowrators and other meters or measuring tanks that are too small to accommodate the quantities of nitrogen solution commonly used today. Such meters may have to be replaced with larger types, but in many cases they can be increased in capacity rather easily. It pays to see if the meter

manufacturer provides such a service before replacing with a larger meter.

It goes without saying, that with so many variables that can cause problems, the *least* the producer should have is up-to-date equipment in top condition, and a thorough knowledge of basic techniques. He will have enough to do just keeping up with preventive maintenance. One of his most important jobs is checking the air handling system. Any leaks here can seriously reduce the effectiveness of both dryers and coolers. Drying, compromised by faulty air systems, often causes poor granulation as well as poor drying, for some systems accomplish a big part of the granulation in the dryer.

Holding the Analysis

The practical limits for combining chemicals are valid only if equipment and techniques were originally sound, and have been protected against corrosion and abrasion. Equally important, they must have been protected against the added deterioration of operations that drift to the "easy way." For the "easy way" usually turns out to be the *wrong* way.

In terms of equipment: Failure to keep the upper and lower connections of gauge glasses on measuring tanks thoroughly cleaned by wire brushing and flushing with water has caused more faulty proportioning of nitrogen solutions than all other causes combined. "Creep" in the gauge glass immediately after the inlet or outlet valve is closed usually indicates that some gauge glass connection is choked. Connections that are above the liquid level can become fouled as well as those that are in contact with the nitrogen solutions. "Creep" can also come from leaking valves, in which case the "creep" continues until pressures are equalized. The "creep" caused by restricted gauge glass connections continues for varying lengths of time, according to the extent of the restriction and the rate of filling the measuring tank. In any case, there is always a lag in the levels between the tank and glass—both in filling and discharging.

Before a gauge glass becomes fully choked, the over-charging and discharging goes as high as 100 pounds per batch. However, the amount of over-charging for the first few batches after restriction of flow begins is too small to be important. Whatever it is it cannot be determined from the analysis of the pile of finished goods. For the inaccuracies started at practically zero and increased to as much as 2 units of nitrogen—with the increase becoming more rapid as flow failed completely. A representative sample could hardly be taken from the pile when the constantly increasing error may have been distributed over the contents of several tank cars.

In terms of technique: Distribution of dry materials and all liquids—*including acids*—in the mixer should be as uniform as possible—for this has direct bearing on the amount of nitrogen retained in the product. This holds for both pulverized and granulated fertilizer.

Water should not be used for flushing the flowrator in sulphuric acid service, for this can cause so much corrosion of the stainless steel float that great inaccuracies will occur.

It is well to remember that low analysis of goods and "shortages" of nitrogen solution, as well as pollution of the air, can be caused by excessive venting of storage and measuring tanks, and too-rapid or non-uniform introduction of the ammoniating media into the mixture. The ammonia gas that leaves the nitrogen solution in such a case is actually 82% nitrogen—forever lost to the fertilizer.

Some plants penalize their production unnecessarily by operating the equipment at less than capacity. Needless to say, it's more efficient to correct whatever condition is forcing this conservatism, so that production can attain full rated capacity at all levels.

Maintaining Top Condition

A sure way *not* to get good condition is to operate mixers and screens that are partially or nearly completely fouled by accumulated deposits. Fouling can be caused by poor distribution of liquids and dry ingredients in the mixer.

Rehandling pulverized fertilizer for drying and cooling after ammoniation at high rate aids condition. Producers should use the solution that needs high rates of ammoniation, especially if there is to be much cooling of the product. When aiming for minimum moisture in pulverized goods, it's best to use ingredients with low moisture content.

DO'S and DONT'S for Better Selling

DO plan ahead! Set a sales quota (a little higher than you think you can reach). Budget *enough* for pump priming: advertising, promotions, etc.

DON'T slight old accounts to develop new ones! Better to fatten up on the bird in hand than starve for the two in the bush.

DO take a personal interest in the customer's problems! It's *his* order—big or small—that interests him most.

DON'T talk price first! Talk profits! The customer is more interested in "get" than "give".

DO create desire for your product! Convince him he needs it—and you couldn't stop him from buying. Demonstrate product quality . . . underscore superiority—if any—over competition.

DON'T ever ignore a customer's complaint! It's better to hear harsh words than not to hear from him at all.

DO keep sales charts! Pinpoint sales trends—total and by accounts—so you can pin down the reasons why.

DON'T lose contact with your customers! Out of sight, out of mind . . . out of orders!

DO show genuine enthusiasm! Sell *yourself* on the product *first*—so customers will know what side *you're* on.

Arcadian News for Fertilizer Manufacturers . . . . . from NITROGEN DIVISION

"I picked 140 bushels of corn per acre following a single plow-down application of 14-7-7 fertilizer" is the profit-building story Julian Luebker tells fertilizer dealer Louis Frank. "In my opinion," says this Henry County, Ohio, farmer, "2-1-1 fertilizer ratios are tailor-made for continuous corn." Corn land like his is only one of many good markets for high-nitrogen 2-1-1 fertilizers.

Profits for Everybody in 2-1-1 Fertilizers!

Everybody wins with high-analysis 2-1-1 fertilizers. This fact is becoming evident to farmers and their agricultural advisors, as well as to fertilizer manufacturers and dealers everywhere. It is the reason why a number of manufacturers have already made the minor plant conversions necessary to make 14-7-7, 16-8-8 and 20-10-10 fertilizers.

To farmers, the success of high-nitrogen mixed fertilizers on major crops is proved in high yields, year after year, with a single, low-cost application each season of a 2-1-1 ratio fertilizer. This success is based on the fact that corn, grass, small grains, cotton and other major crops all consume twice as much nitrogen as phosphoric acid, and considerably more nitrogen than potash.

One of the most pressing needs of every farmer is to save all the labor he can, so as to keep costs down, so that his high yields will return more profit per acre. One application per season of a fertilizer that fulfills all the plant food needs of a crop is a sure work-saver, yield-builder and money-maker! Successful farmers are quick to see the value of these high-nitrogen mixed fertilizers. Now you can make them—and make money doing it.

Practical and Profitable

The technique for making these high-nitrogen grades at low cost is ready and waiting for you. Nitrogen Solutions developed by Allied Chemical research enable you to make 2-1-1 ratio fertilizers with modifications of your present equipment and processes. Because all the nitrogen for these fertilizers comes from Nitrogen Solutions, your cost per ton is low. At the same time, you can sell this extra nitrogen tonnage to greater advantage in mixed fertilizers than as straight nitrogen top-dressing. And by putting all the plant foods in one package, you don't risk the loss of part of the nitrogen sale in the form of nitrogen top-dressers. Once over the field does the whole job for the farmer. And one sale by your dealer sells all the plant food each acre needs and gets.

Hundreds of field demonstrations by farmers, dealers and county agents have shown the practical benefits of these high-nitrogen fertilizer grades. You will profit by encouraging your dealers to set up such field tests with the 2-1-1 fertilizers you manufacture. It will pay you to get all the facts on the benefits of making and selling 2-1-1 ratios. Write or call Nitrogen Division, Allied Chemical, 40 Rector Street, New York 6, N. Y.

New Research in Pine Forest Fertilization

How to make fertilizer application pay on pine forests is the aim of a new research study sponsored by Nitrogen Division at the North Carolina State College Department of Forest Management.

First aim of the work with loblolly pine, an important timber tree, is to determine the conditions under which it pays to use fertilizer. This involves finding the minimum amounts of nutrients a tree can have in its foliage without limiting growth, along with fertilizer applications in analyses based on soil and foliage tests.

The work is being done with pines growing on Piedmont and Coastal Plain soils, on forest sites of good, medium and poor quality.

CORRECTION

The sulfuric acid table on page 1 of the *Arcadian News, Volume 4, Number 1,* had one incorrect figure in it. This table should have read as follows:

SULFURIC ACID

Grade	Per Cent Acid	Per Cent Water	Pounds Reacting With 1 lb. Ammonia
60° BE	77.67	22.33	3.71
66° BE	93.19	6.81	3.09
	100.00	0	2.88*

*(For comparison—not used.)

If you keep file copies of the *Arcadian News,* we suggest that you make this correction. We trust that this typographical error caused you no inconvenience. Such things occasionally happen despite all precautions.

HERE'S THE BIG LINE OF Arcadian® NITROGEN SOLUTIONS

When you purchase your nitrogen requirements from Nitrogen Division, Allied Chemical, you have many different nitrogen solutions from which to select those best suited to your ammoniation methods and equipment. You are served by America's leading producer of the most complete line of nitrogen products on the market. You get formulation assistance and technical help on manufacturing problems from the Nitrogen Division technical service staff. You benefit from millions of tons of nitrogen experience and the enterprising research that originated and developed nitrogen solutions.

	CHEMICAL COMPOSITION %						PHYSICAL PROPERTIES		
	Total Nitrogen	Anhydrous Ammonia	Ammonium Nitrate	Urea	Water	Neutralizing Ammonia Per Unit of Total N (lbs.)	Approx. Sp. Grav. at 60°F	Approx. Vap. Press. at 104°F per Sq. In. Gauge	Approx. Temp. at Which Salt Begins to Crystallize °F
NITRANA®									
2	41.0	22.2	65.0	—	12.8	10.8	1.137	10	21
2M	44.0	23.8	69.8	—	6.4	10.8	1.147	18	15
3	41.0	26.3	55.5	—	18.2	12.8	1.079	17	-25
3M	44.0	28.0	60.0	—	12.0	12.7	1.083	25	-36
3MC	47.0	29.7	64.5	—	5.8	12.6	1.089	34	-30
4	37.0	16.6	66.8	—	16.6	8.9	1.184	1	56
4M	41.0	19.0	72.5	—	8.5	9.2	1.194	7	61
6	49.0	34.0	60.0	—	6.0	13.9	1.050	48	-52
7	45.0	25.3	69.2	—	5.5	11.2	1.134	22	1
URANA®									
6C	43.0	20.0	68.0	6.0	6.0	9.3	1.180	12	39
6M	44.0	22.0	66.0	6.0	6.0	10.0	1.158	17	14
10	44.4	24.5	56.0	10.0	9.5	11.0	1.114	22	-15
11	41.0	19.0	58.0	11.0	12.0	9.2	1.162	10	7
12	44.4	26.0	50.0	12.0	12.0	11.7	1.087	25	- 7
13	49.0	33.0	45.1	13.0	8.9	13.5	1.033	51	-17
15	44.0	28.0	40.0	15.0	17.0	12.7	1.052	29	1
U-A-S®									
A	45.4	36.8	—	32.5	30.7	16.2	0.932	57	16
B	45.3	30.6	—	43.1	26.3	13.5	0.978	48	46
Anhydrous Ammonia	82.2	99.9	—	—	—	24.3	0.618	211	-108

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WORKING SAFELY...

Safe Handling of Liquids Requires Trained Personnel

By A. R. Cline
Marketing Engineering Department
Ammonia Division
Shell Chemical Corp.
San Francisco, Cal.

A PRIME factor in the safe handling of liquid fertilizers is the mental attitude, knowledge and training of personnel required to handle these products. Of almost equal importance, however, is the selection of properly designed equipment for product handling.

Some believe that they cannot afford what they consider elaborate installations, while others state that a price cannot be placed on safety. These are the extremes.

Actually, economy of operation and safety are inter-related. Personal injury, lost man hours and sales, destruction of capital equipment and loss of product are a high price to pay for a relatively small "saving" in initial investment.

Prior to loading, unloading or further handling of any product, one should be completely familiar with its physical and chemical properties. The use and number of liquid fertilizers are continually expanding. Anhydrous ammonia, nitrogen-containing solutions and phosphoric acid are the primary products which must be considered in any safety discussion. With regard to pressure, nitrogen solutions might not be considered as hazardous as anhydrous ammonia. However, the ammonia contained is volatile and must be treated with as much respect as anhydrous.

With proper equipment and procedures, all fertilizers can be handled safely. Anhydrous ammonia requires properly rated pressure handling and storage equipment. Equipment for other materials may also require pressure equipment for items such as hose, lines and pumps.

The selection of a location within a plant is important. Such a choice for loading or unloading operations is based on many factors having direct bearing on the economy and safety of the operation.

Adequate space should be provided to allow for turn-around and to meet legal clearances whether the location is on a rail siding, a roadway for truck delivery or a combination of the two. However, it should not be located at such a distance from the remainder of the plant that it becomes inconvenient or inaccessible for normal or emergency operation.

This distance will normally be a compromise between obtaining the required space and the cost of running lines from the station into the plant. Wind direction should be taken into consideration for volatile solutions as to the plant layout and adjoining property. And finally, the location selected should provide adequate ventilation and a quick and easy exit in case of a hose failure. Also, in the loading or unloading station care should be taken that all equipment and lines are grounded.

Equipment and materials of construction should be designed and selected to meet all applicable codes, regulations and operating requirements.* An installation designed for one product should not be used for another unless it has been determined it is completely safe to do so. For instance, anhydrous ammonia and certain fertilizer solutions require stress-relieved containers. Others are corrosive and require stainless steel or lined tanks.

If contamination or unsafe conditions might arise from the mixture of two products, the system must be completely flushed and purged before switching from one product to another. We have heard of a liquid mix plant operator who proposed to unload a tank car of phosphoric acid, using pressure from ammonia. Fortunately he was dissuaded in time. Compressed air is sometimes used to unload solutions. But with some materials, such as spent sulphuric acid, the use of air may lead to the creation of an explosive mixture in the receiving tank.

The equipment and station layout should be so designed that the operator may quickly and easily perform his required functions without undue risk or hazard to himself. Again, easy exits should be provided

*At least ten states have statutory requirements relating to equipment design standards, periodic inspections and other provisions for safety. Additional states are in the process of preparing such regulations. It is of course wise to check state and local provisions covering your plant.

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Approved by government and college experiment and extension facilities, Espesol 5 is a premium quality, high specification diluent that will let you offer your customers a premium product. Available to you on short notice from all of Eastern States' terminal facilities, Espesol 5 can be ordered in drum, transport, tank car, barge and ship tank lots.

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with conveniently located emergency shut-offs in case of some equipment failure. In some cases an interlock system between valves, pumps and/or motors may be desirable to further protect the operator from making an error.

If at all feasible the loading or unloading station should be made a permanent installation with provision for easy access to the top of tank cars, if required, and storage for hose, operating and safety equipment.

Personal safety equipment, such as eye shields or splash proof goggles and rubber or plastic gloves, should be supplied all personnel connected with the loading or unloading operations. Providing such equipment is not enough however, personnel must be trained in the use of such equipment until it becomes second nature. Further protective clothing such as rubber aprons or suits should be available if conditions or the operation might warrant their use.

In addition to the above mentioned personal equipment, emergency safety devices, such as a full face gas mask, first aid kit, eye wash fountain and shower should be located at or near the operating plant. Fire fighting equipment and an adequate water supply should also be located at this point. In most accidents involving liquid fertilizers, the first requirement is an abundant supply of fresh water.

Normally, larger plants with confined spaces will also have on hand such emergency rescue equipment as full protective clothing and self-contained breathing apparatus.

Correct and complete operating procedures should be laid out for each operation duly noting any regulations or codes which may be concerned.

An all-too-common accident is the movement of a tank car, or truck, hooked into the system which usually results in a broken hose or connection with a consequent loss of product and poor employe and public relations. A properly blocked car with its brakes set and warning signs, according to I.C.C. and A.R.A. regulations, will usually prevent this occurrence.

In any operation involving a hazard, particularly at night, it is a good practice not to let an operator work alone. Provision may be made for an extra operator to be in the area or if this cannot be justified, someone who is normally working nearby should be thoroughly trained in the operation and emergency procedures.

All personnel concerned should be thoroughly schooled in the use of all safety equipment and emergency procedures. Periodic drills and reviews should be conducted in the correct procedures and use of this equipment. These procedures, in turn, must be constantly reviewed and revised if necessary. And finally, the personal safety habits and training of individuals cannot be overstressed.

Safety Workshop Planned for May

CHICAGO—Safety in chemical industry operations and the handling of chemicals will be discussed on Thursday, May 21, in a workshop sponsored by the Manufacturing Chemists' Assn. at the Palmer House, Chicago.

Members of the general safety committee of MCA and S. F. Spence, American Cyanamid Co., chairman, and J. S. Queener, E. I. du Pont de Nemours & Co., vice chairman, will form the discussion panel.

There will be no prepared program. Both the morning and afternoon sessions will be devoted to discussion of safety problems or queries raised by the audience. The extemporaneous nature of the meeting provides opportunity for analysis and exploration of the chemical industry's safety customs and techniques. This will be of interest to those concerned with the handling and storage of chemicals, as well as chemical industry safety engineers.

Welcoming remarks will be by Alfred C. Stepan, Jr., president, Stepan Chemical Co., Chicago.

Fertilizer Round Table Proceedings Available

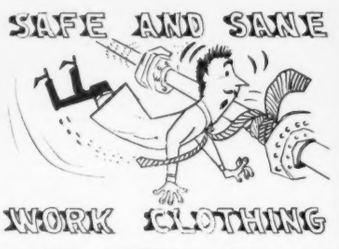
Proceedings of the 1958 Fertilizer Industry Round Table are now available, according to Dr. Vincent Sauchelli, chemical technologist, National Plant Food Institute, Washington, D.C., chairman of the Round Table. Copies are priced at $3 each and are available from Dr. Sauchelli at the NPFI headquarters, 1700 K St., N.W., Washington 6, D.C., or H. L. Marshall, 1604 Walterswood Rd., Baltimore, Md.

The volume contains a complete transcript of the entire three-day symposium held Nov. 5-7, 1958, at the Mayflower Hotel, Washington.

Louisville Chemical Firm Purchased by Selig

ATLANTA, GA.—The Selig Co. has purchased the Hygeian Chemical Co. in Louisville, Ky., it was announced.

Prior to the sale, the Louisville firm was chiefly a chemical jobber, selling insecticides. In the future, a spokesman said, it will make and sell insecticides and other products.



PROPER CLOTHES—Trouser legs should be about ankle length. It is best to have the cuffs sewn up or cut off, as they may otherwise come down and cause you to trip. Wearing ragged or frayed pant legs is inviting trouble.

Neckties are taboo around moving machinery. Short sleeves are preferable; in inclement weather, a suitable jacket fastened securely at the wrist is safe. Do not roll up long sleeves, as they have flapping ends and the added thickness of cloth can pull your arm in a machine before the cloth tears. Most jobs, especially around temperature extremes, require long sleeves.

Safety shoes and hard hats in good condition are always recommended.

Work clothes should be washed frequently as a safeguard against skin infections and irritations.—Spencer Chemical Co. Bulletin.

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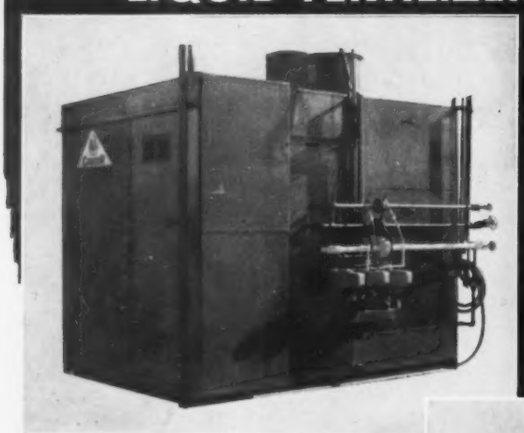

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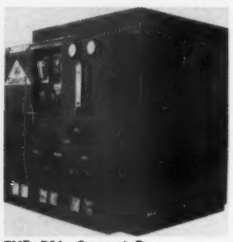

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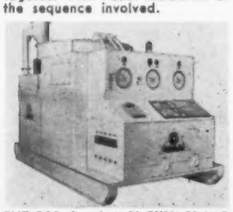
Automatic or manually controlled liquid nitrogen "package units" for converting anhydrous ammonia to aqua ammonia.

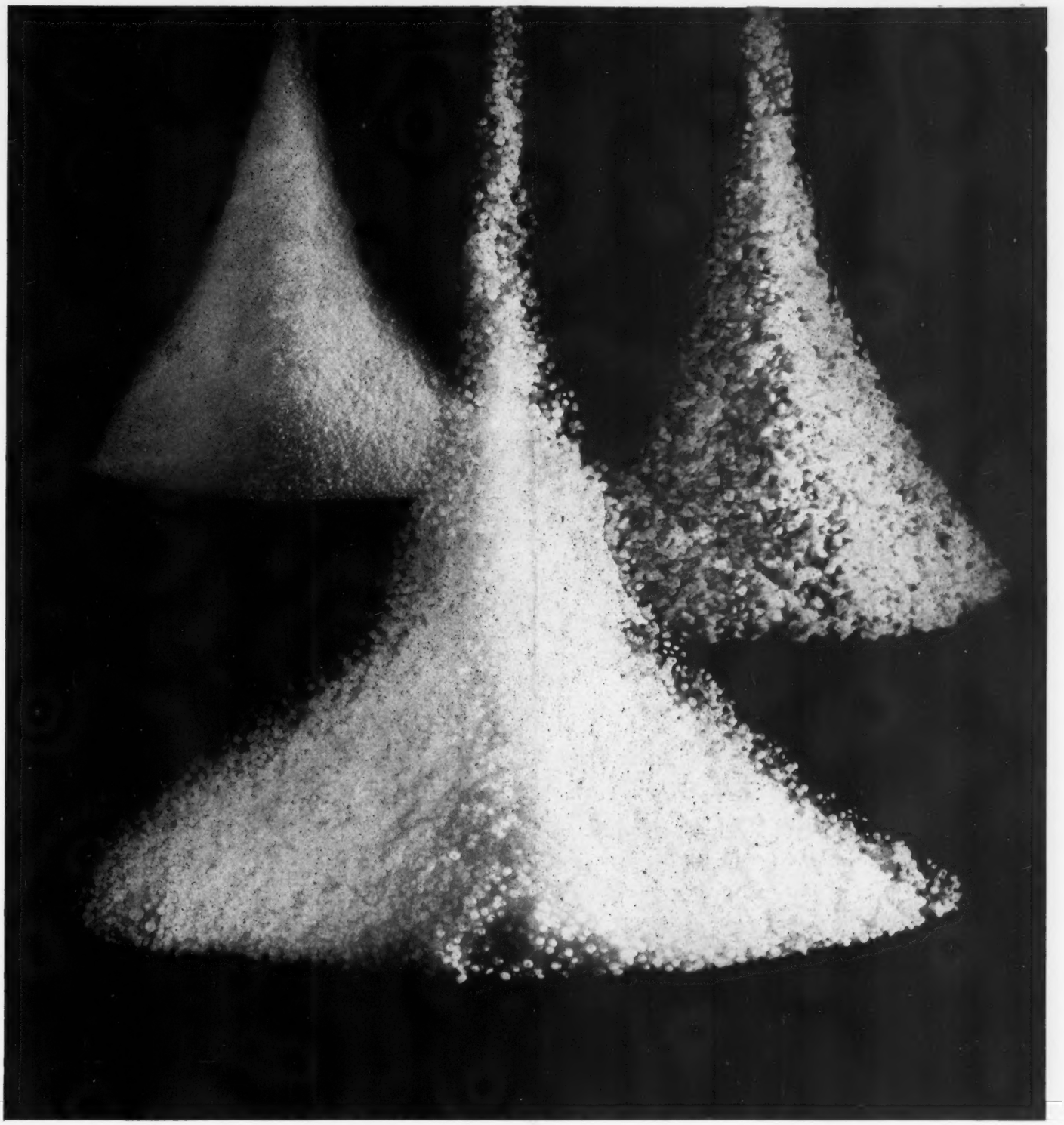
THE B&L LiquibatcheR
An exceptionally low cost batch processing unit. Features semi-automatic operation.

THE B&L AutobatcH
Designed specifically for converting standard batch operated plants to the proven continuous ammoniation process.

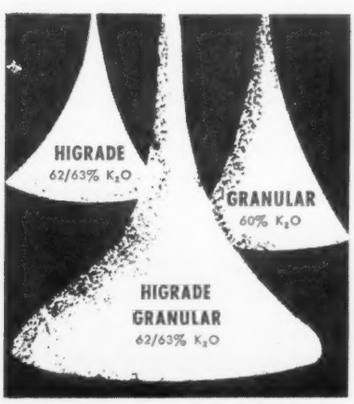
B&L GRAPHIC CONTROL PANEL
Furnished as standard equipment on the B&L AutobatcH line and provides remote control and operation of various components together with visual indication of the sequence involved.



THE B&L AutobatcH SKID PLANT
Ultimate in batch-type "complete package" units. Features the fully automatic continuous acid neutralization process.



Better fertilizers begin with three non-caking grades of USP potash



USP's *three* outstanding grades of potash are specially refined to resist caking and remain free-flowing from manufacture to application. And all three are specially sized, too, in perfect grades to meet all modern fertilizer requirements. Two white grades—Higrade muriate and Higrade Granular muriate—each give you more potash per ton (62/63% K_2O) than any other potash available. And USP's Granular muriate (60% K_2O) is ideal for products where a still larger particle size is required.

For complete technical data and shipping information, contact the United States Potash Company. Our expertly staffed Technical Service Department welcomes your inquiries.

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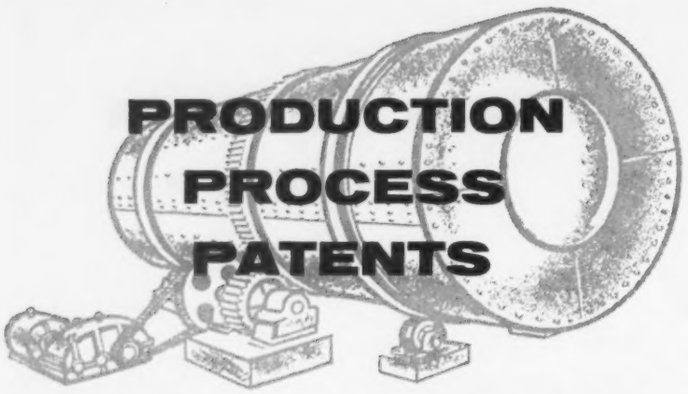
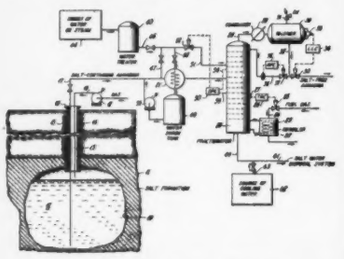


2,877,100

Sulfur Recovery. Patent issued March 10, 1959, to Henry J. Hartley, Los Angeles, and Clarence S. Rankin, San Francisco, Cal., assignors to Pacific Foundry Co., Ltd., San Francisco. In the treatment of particles of solid material containing elemental sulphur to recover the latter, the improvement which comprises introducing the solid material containing not to exceed about 5% moisture into a heating zone, passing a thin bed of the particles continuously over a hearth in the heating zone while subjecting these particles to agitation, maintaining the heating zone at a temperature above the melting point of sulphur, heating the particles passing through the zone from below the melting point of sulphur to above the melting point of sulphur so rapidly that the proportion of the sulphur existing in hot viscous state is insufficient to bring about the formation of substantial aggregates of the particles in the bed by cementing due to the presence of the viscous sulphur, the heating of the particles being accomplished by passing through the zone in contact with the particles a hot stream of substantially non-reactive gaseous combustion products of carbonaceous fuel and air high in CO_2 and containing substantially no CO and no oxygen, continuously withdrawing from the zone the resulting mixture of gas and sulphur vapor at a temperature below 1475° F., partially cooling the withdrawn mixture by indirect heat exchange to a temperature substantially below 850° F. but without removing any substantial quantity of sulphur from the partially cooled mixture and thereafter bringing the partially cooled mixture into contact with liquid sulphur to remove the sulphur from the gaseous mixture.

2,878,165

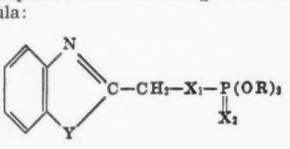
Ammonia Storage and Recovery System. Patent issued March 17, 1959 to John E. Cottle, Bartlesville, Okla., assignor to Phillips Petroleum Co., Bartlesville. The method of separating substantially anhydrous ammonia from salt which comprises introducing ammonia containing dissolved salt into a fractionation zone, withdrawing anhydrous ammonia overhead from said fractionation zone, withdrawing salt water as a bottoms product from said fractionation zone, and introducing water in a fluid state into the fractionation zone at a point above the point of introducing said ammonia to facilitate the separation and prevent deposition of salt within the fractionation zone.



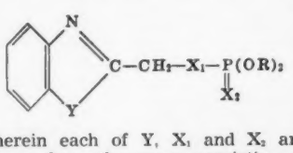
The method of storing and recovering ammonia which comprises introducing ammonia into a storage cavern formed in a subterranean salt formation, withdrawing ammonia containing dissolved salt from said cavern and feeding it to an intermediate region of a fractionation zone, supplying heat to the bottom of said zone and withdrawing heat from the top of said zone so as to maintain conditions therein suitable for the separation of anhydrous ammonia from salt water, introducing water to said fractionation zone at an intermediate region thereof at a point above the point of feed introduction, withdrawing substantially anhydrous ammonia from the top of the zone, and withdrawing salt water from the bottom of the zone.

2,877,153

Benzoxazolemethyl and Benzothiazole-Methyl Phosphoric Esters. Patent issued March 10, 1959, to Jean Metivier, Arpajon, France, assignor to Societe des Usines Chimiques Rhone-Poulenc, Paris, France. A phosphoric ester of the general formula:



wherein each of Y, X_1 and X_2 are chosen from the group consisting of oxygen and sulfur atoms, and R represents an alkyl group containing from 1 to 4 carbon atoms. A pesticidal composition which comprises a phosphoric ester of the general formula:



wherein each of Y, X_1 and X_2 are chosen from the group consisting of oxygen and sulphur atoms, and R represents an alkyl group containing from 1 to 4 carbon atoms in pesticidal concentration diluted with at least one diluent compatible therewith.

DAVISON Hi-Flo Gran-U-Lated Triple Superphosphate is unexcelled by any other

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NEWS DIGEST OF THE WEEK

Virginia-Carolina Promotes Pair

Douglas W. Laird Charles T. Harding

RICHMOND, VA.—Charles T. Harding and Douglas W. Laird have been elected vice presidents of Virginia-Carolina Chemical Corp., it has been announced. Mr. Harding will serve as vice president in charge of fertilizer manufacturing and Mr. Laird will be in charge of purchasing.

A native of North Carolina, Mr. Harding began his V-C career in 1918 at the company's former fertilizer plant in Washington, N.C. He later served as foreman in two plants in Charleston, S.C. He also has served in various manufacturing and sales capacities in Ft. Wayne, Ind., Carteret, N.J. and Columbia, S.C.

He was transferred to Richmond in 1953 as general superintendent in manufacturing. He was named manager of the manufacturing department in fertilizer in 1950 and general manager a year later.

Mr. Laird was previously manager of the purchasing department. He is a second generation V-C employee. His father, the late Howard N. Laird, was northern sales manager for the fertilizer division, his mother worked in the tax department and his uncle, the late C. F. Sims, was sales manager at Carteret.

A native of Durham, N.C., Mr. Laird moved to Richmond in 1935 when his father was transferred there.

He joined V-C's purchasing department in 1948 and in 1954 was named assistant manager and was in charge of industrial purchases. He was named manager in 1956.

Fertilizer Research Reorganized at TVA

KNOXVILLE, TENN. — Reorganization of TVA's fertilizer research and development activities, effective April 5, has been announced by J. H. Walthall, director of the division of chemical development.

The division, part of TVA's office of chemical engineering, conducts research in chemistry and engineering to develop processes for the production of new and improved fertilizers and materials for national defense.

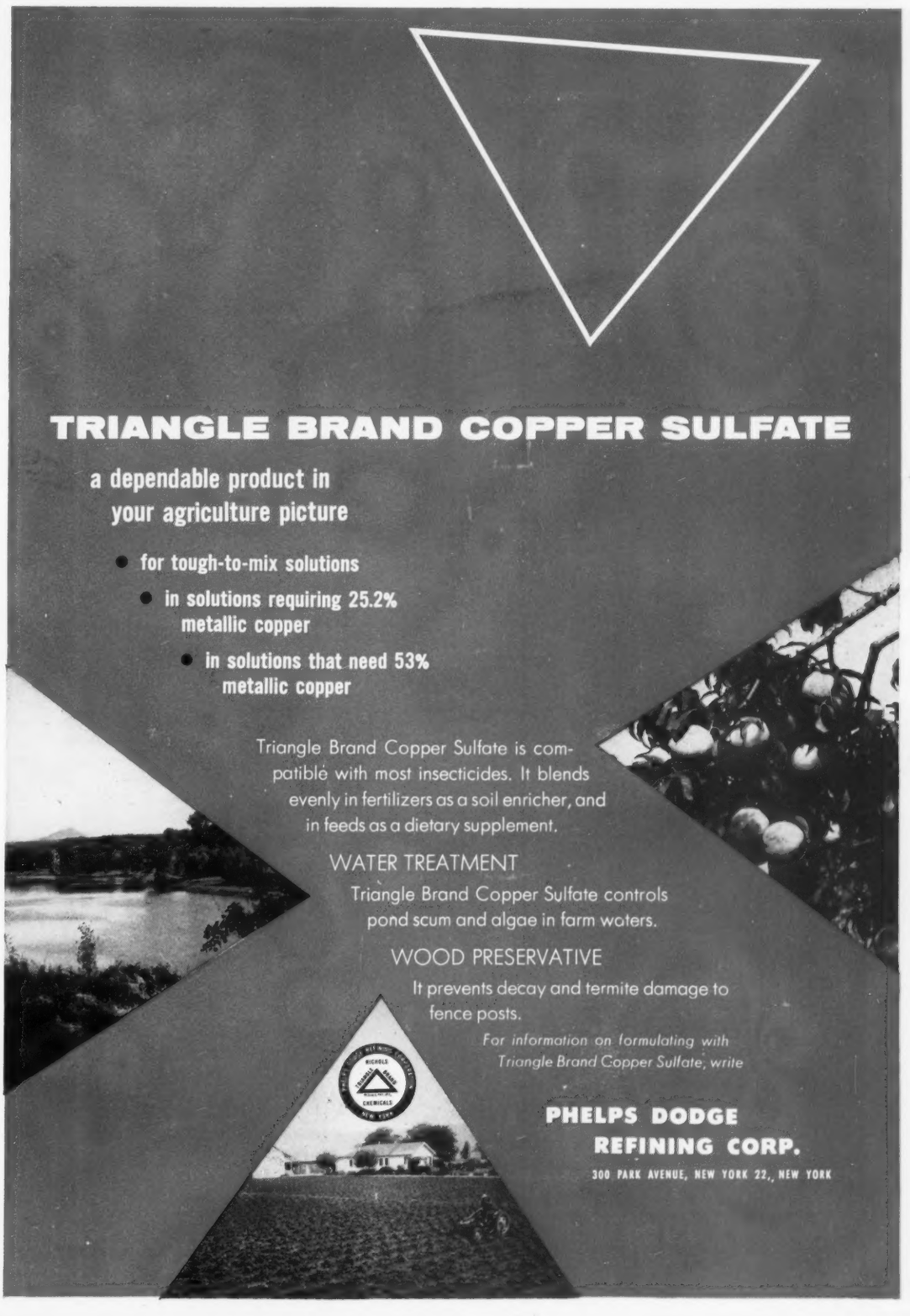
The primary purpose of the reorganization, TVA says, is to place more emphasis on the development of processes and advanced technology to aid the fertilizer industry and agriculture. Under the reorganization the work of the division will be handled by a fundamental research branch, an applied research branch, a process engineering branch, and a design branch.

The fundamental research branch, headed by Dr. Kelly L. Elmore, conducts long-range chemical research studies of problems relating to the behavior of fertilizers in soils, conducts fundamental research to discover new chemical knowledge about fertilizer products and processes, and renders various research services.

The applied research branch, headed by Travis P. Hignett, is composed of both research chemists and chemical engineers. It will conduct chemical and small-scale engineering research to define, develop, evaluate new and improved fertilizer processes and promote their commercial use.

The process engineering branch, headed by Alvin B. Phillips, designs and operates pilot plants directed toward the development of processes and to obtain data for the design of demonstration- and large-scale plants and to produce new fertilizers.

In addition, the position of staff chemical engineer was established. The staff chemical engineer, M. M. Striplin, Jr., will advise the manager of chemical engineering and the director of chemical development on chemical engineering problems and will assist in promoting the adoption of successful TVA developments.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Properties and Compatibility Of Phosphoric Acid Discussed

By C. E. Brissenden*
Fertilizer and Mining Div.
J. R. Simplot Co.
Pocatello, Idaho

CHARACTERISTICS of phosphoric acid (wet acid) are of importance to fertilizer-producing firms whose use of the material comprises an important area of operation.

First, a review of the raw material itself. Phosphate rock or tri-calcium phosphate is found in the western phosphate field. The phosphoric formation, suitable for wet process acid production, is oolitic or granular and approximately four feet thick. It is interesting to reflect that these deposits were made some 200 million years ago during the Permian Age.

Today we systematically dig them up, crush them, and throw them in with sulphuric acid and water to produce phosphoric acid—first with about 25-30% P_2O_5 content and then concentrated to 0-52-0. Sometimes it is known as "green acid" with the green color coming from traces of vanadium and chromium. The pH of 0-52-0 is less than 1-, in fact you might not even get a reading on a pH meter. Weight wise, we are talking about a 14.2 lb. per gallon product, which has a freezing point somewhere below –20° F.

Precautions are required when handling phosphoric acid since it is corrosive and causes skin irritation. It is a non-pressure material that can be handled safely. Contact with skin and particularly the eyes should be avoided by the use of rubber or plastic type gloves and glasses. In case of contact, flush the skin or eyes with plenty of water for at least 15 minutes. For the eyes, get medical attention.

One should be familiar with the materials to use in storing or handling phosphoric acid. In general use are stainless steel, rubber, plastic, plexiglass, fiberglass or mild steel, coated vinyl based paints such as amercoat or tygon; all are quite satisfactory. In a recent test an uninhibited 0-30-0 containing 2% $ZnSO_4$ reduced the weight of a mild steel bar by almost 30% in 108 hours. In contrast, the bar of mild steel in inhibited 0-30-0 containing $ZnSO_4$ lost only 6% of its weight in the 108 hour period.

This test was rather extreme since the steel bars were washed twice each day, thereby removing any protective coating that had been established. By contrast, the uninhibited 0-30-0, containing 3% by weight of a 2 lb. emulsifiable aldrin, caused the steel bar to lose about 7% of its weight in 108 hours. In a similar solution, containing an inhibitor, the steel bar lost 4% in weight during a like period.

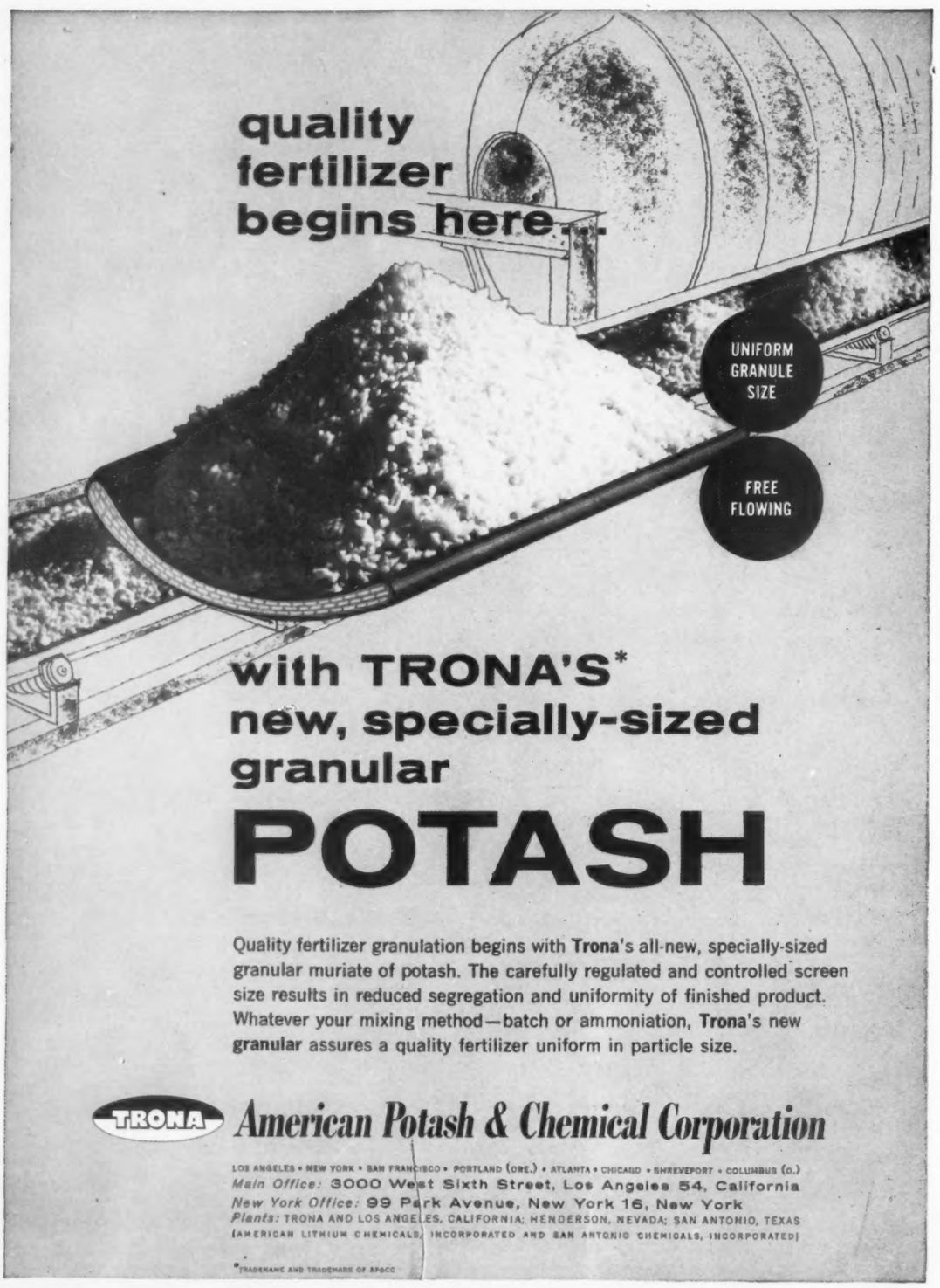
In considering compatibility with insecticides, herbicides, and minor elements, there is very little data. This is probably true due to a lack of interest in the past in using these materials alone with phosphoric acid. The inhibitor was not compatible with $ZnSO_4$ or iron sulfate. These two compounds appear to mix satisfactorily with straight 0-30-0. The emulsifiable aldrin and 2,4-D appeared partially to separate and were difficult to keep in solution.

Phosphatic fertilizers produced in the West are noted for their contamination—and fortunate we are for most of these impurities. In the Midwest and West there are localized areas deficient in one or more of the minor elements, particularly iron, zinc, manganese, molybdenum and magnesium. The phosphatic fertilizers produced in the West contain these elements in quantities, which may be of value on our Western soils.

Besides using phosphoric acid in making triple superphosphate it is used with anhydrous ammonia in producing dry ammonium phosphate such as 11-48-0, with ammonia and sulphuric acid to produce ammonium phosphate sulphate products such as 16-20-0, with anhydrous ammonia or aqua ammonia to produce neutral liquid mixes such as 16-8-0. TVA has reported on some work using wet process phosphoric acid, superphosphoric acid, and ammonia in producing neutral liquid mixes.

Considerable phosphoric acid is used in direct application, either alone or with anhydrous, aqua or other nitrogen solution. From an agronomic standpoint, there is apparently no great difference between the dry single and triple phosphates and phosphoric acid. The complete water solubility of the phosphate in the acid may slightly improve plant response, but, on the other hand, may render it insoluble more quickly in acid soils. In localized situation, on alkaline soils, liquid with an acid reaction may prove superior to dry materials. The use of phosphoric acid, both furnace grade and wet process, as direct application fertilizer is reported to have increased from 6,000 tons in 1949 to 18,000 tons in 1957. This use is primarily in the western states in the irrigated and winter wheat areas.

*From talk before Pacific Northwest Plant Food Assn., Gearhart, Ore., Oct. 23-24, 1958.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READER VIEWS

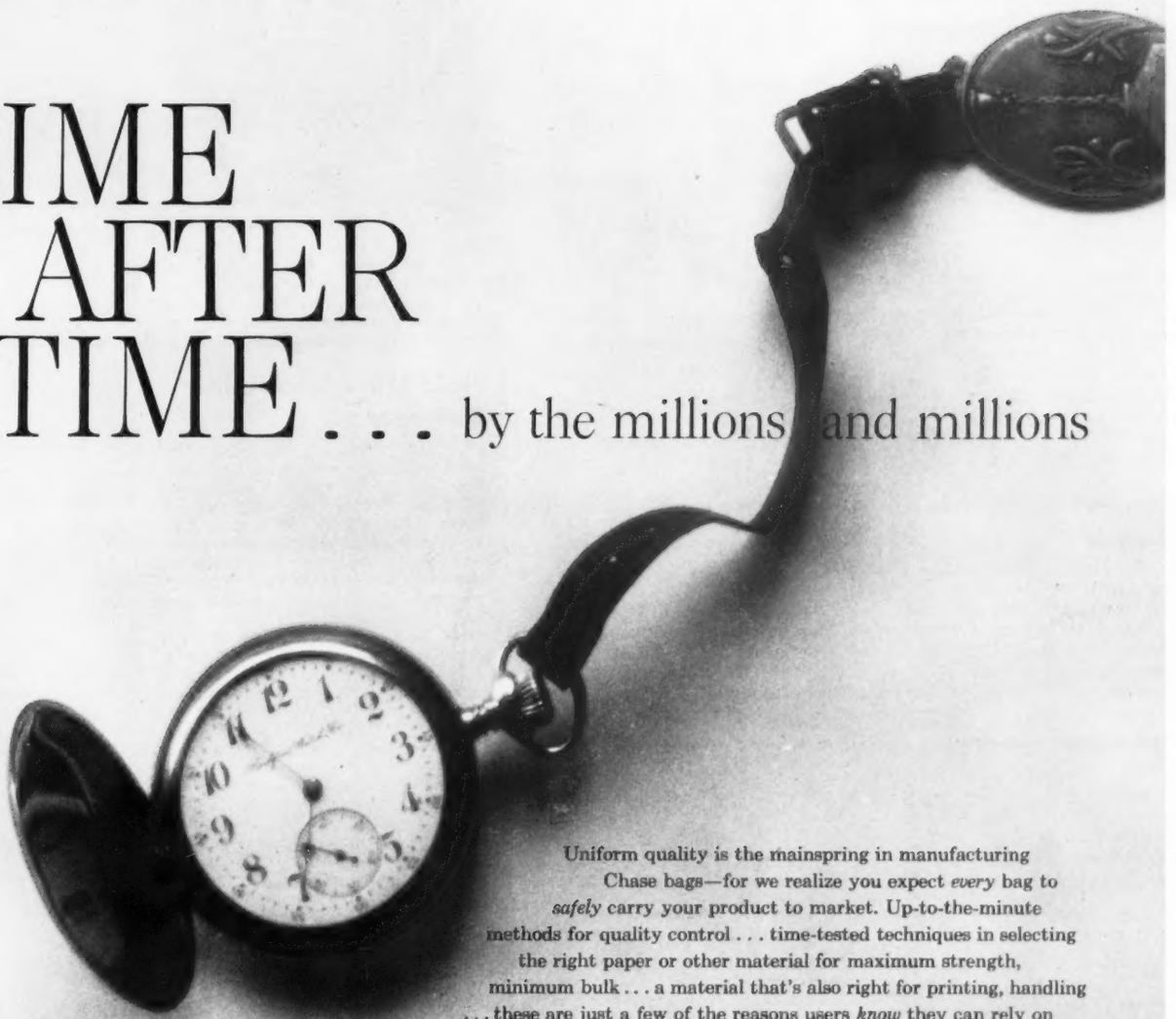
To the Editor:

I would like to express my sincere appreciation for the splendid article about me in your issue of March 16. I just want you to know that I have received many nice compliments about this article from friends in the fertilizer industry.

I think you do an excellent job in the production of your magazine and many people in our organization are able to keep abreast of some of the problems in the industry because of this fine magazine.

Sam E. Shelby
Federal Chemical Co.
Louisville, Ky.

TIME AFTER TIME . . . by the millions and millions



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What's New?

Additional information is available about new products, new services, and literature described in this department. Circle the numbers of items on which you desire more information, fill in your name, your job title, your company's name and address on one of the cards. Then clip it out of the page and mail. No postage is necessary.

No. 9055—Anti-Caking Agent

Minerals & Chemicals Corp. offers data on the physical and chemical properties of its product "Attacote," described as a new fine particle size, sorptive clay material specifically made for fertilizer manufacturers and makers of other hygroscopic chemicals. M&C states that the product has performed well as a coating for prilled, granular and explosive ammonium nitrate; ammonium sulfate; agricultural grades of urea and other granular high-analysis fertilizers. The material is a magnesium aluminum silicate, inert and non-toxic. The makers say that it has a low bulk density and favorable properties as an adherent and as a desiccant. Complete specifications are available. Check No. 9055 and mail.

No. 9043—Tractor-Loader

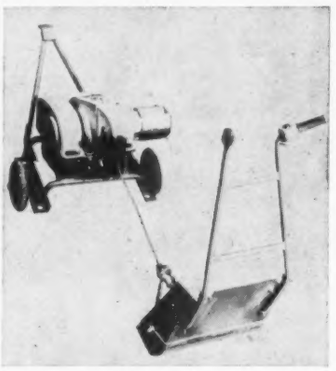
The Frank G. Hough Co. announces a rubber-tired, four-wheel-drive model "H-90 Payloader." The unit was designed to replace the company's former HO model. The unit's load carry capacity is 9,000 lb. at travel speeds. Both gas and diesel power units are offered. Buckets to handle materials of various weights are available in sizes from 1½ to 5 cu. yd., S.A.E. rated bucket sizes. A "low profile" front shroud gives the operator improved visibility, the company says. For complete information, check No. 9043 on the coupon.

No. 9054—Bulletin on Pumps

A bulletin covering pumps for fertilizer and temperature controlled liquids has been issued by the Dean Hill Pump Co. The publication discusses results of tests made with the pumps and contains data on performance. Illustrations and diagrams of the pumps are included. For further information, check No. 9054 on the coupon and mail.

No. 9056—Power Shovel

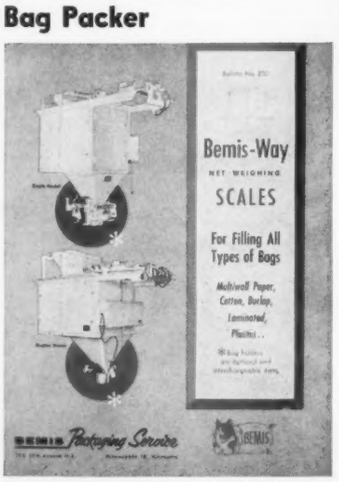
A one man power shovel has been introduced by Seedburo Equipment Co. Designed for complete portability, the shovel has many built-in safety features, the company says. A push-button in the shovel handle controls the pulling action and functions as a "dead man" switch, giving positive control to the operator. If the operator releases the push-button, the pulling cycle stops instantly. According to company literature, the unit is especially adaptable for flat storage buildings, feeding marine legs on barges and unloading truck grain, feed or fertilizer. Various scoop designs are available as standard equipment. Check No. 9056 and mail.



No. 9048—Automatic Palletizer

A new automatic palletizer has been introduced by Miller Engineering Corp. for bag stacking operations, particularly those working two or three shifts. The palletizer is said to be completely automatic and requires no operator. According to the makers, each unit features either a Westinghouse Cypak automatic magnetic control system or standard relay controls. As a result, each stage of positioning the patterns and stacking is automatically controlled. Any type of pallet (metal, paper or wood) may be used for stocking, the makers state. Operating parts of the automatic palletizer comprise a motor-driven roller table, an elevator and an automatic ram. The roller table accepts and positions the bags and when a pattern is complete, the roller table moves from under the pattern and automatically stacks it on the elevator below. The elevator, in turn, descends one position as each layer of the stack is added. When a stack is complete, an automatic ram pushes the stack off the elevator for pickup by a fork truck or conveyor. For full details, check No. 9048 on the coupon.

No. 9052—Flexible Bag Packer



A four-page bulletin describing its new "Bemis-Way Scale" has been produced by Bemis Bro. Bag Co. The product is said by its makers to be a flexible bag packer adjustable to handle free-flowing or semi-free-flowing products. It is made in either a single or duplex-scale model, they say. Further information from Bemis says the bagger can fill and weigh 25 to 200-lb. size multiwall paper, polyethylene or textile bags at speeds up to 18 bags a minute. Weight accuracy is within 2 ounces, Bemis says. A gravity bulk or vibrator bulk feed system is optional. Each packer is specially engineered for specific products such as fertilizer and pesticides. Optional features include different bag holders, stainless steel product contact surfaces, corrosion-resistant paint and sewing machine pedestal and conveyors designed especially for this scale. The new bulletin contains operation and engineering specifications. It is available by checking No. 9052 on the coupon.

No. 9049—Equipment Catalog

Squibb-Taylor, Inc. has issued a new catalog covering its line of anhydrous ammonia equipment including valves and controls, visible liquid gauges, flow indicators, hoses, fittings and pumps. The catalog gives full details of equipment including specifications, illustrations, schematic drawings and written descriptions. For a copy of the catalog, check No. 9049 on the coupon.

No. 9045—Dust-Tight Valve

A new dust-tight valve for use with equipment processing dry solids has been announced by Patterson-Kelley Co., Inc. The valve is described as being compact and stainless for application on equipment involved in blending, conveying, milling or similar operations where discharge and flow of powdered or granular materials must be controlled. Available accessories include special adapters for mounting the valve on existing equipment, the makers state. According to the manufacturers, all components of the new valve are precision machined for complete interchangeability. The valve body is covered with a removable neoprene liner and the vane and "O" ring sealed shafts are made of chromium-nickel stainless steel. Easy adjustments can be made for exact positioning and compensated positioning after long wear, the company says. Check No. 9045 on the coupon for additional literature.

Send me information on the items marked:

- ☐ No. 9043—Tractor-Loader
- ☐ No. 9044—Safety Mask
- ☐ No. 9045—Dust-Tight Valve
- ☐ No. 9046—Air-Moving Equipment
- ☐ No. 9048—Automatic Palletizer
- ☐ No. 9049—Equipment Catalog
- ☐ No. 9052—Flexible Bag Packer
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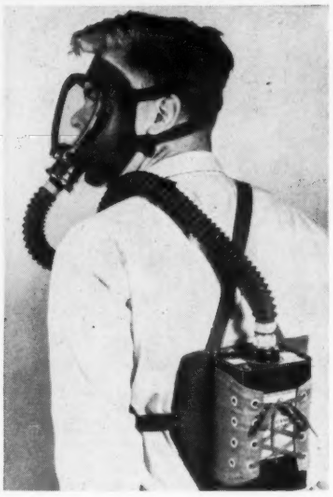

A new safety mask, effective against toxic fumes, has been announced by Acme Protection Equipment Co. Four special features are described by the makers. One is the back mounting of the canister, assuring that its inlet is in the least contaminated air surrounding the operator. The canister pouch is adjustable to fit various sizes of canisters, the makers say. In case the operator may wish to use different canisters for various gases or desires to connect quickly to fresh canisters, the outfit offers a quick change feature with threaded canister necks. The quick change connection is also available at the facepiece so chin style canisters may be used if desired. Check No. 9044 on the coupon for a bulletin describing this equipment.

No. 9046—Air Moving Equipment

Wm. W. Meyer & Sons, Inc., offers a handy reference guide for industrial firms where the installation and operation of blowers, fans, exhausters and other air-moving equipment are a factor. The unit, as described by the firm, consists of a letter-size file folder, engineering data sheets and stock lists of all types of rebuilt and new air-moving equipment. Engineering data sheets provide basic and essential information pertaining to steel plate exhausters, rotary positive blowers and pneumatic conveyors. Check No. 9046 on the coupon for one of the folders described.

SOLAR

Continued from page 2

oped suitable procedures and installation for concentrating the weak brines by solar evaporation.

The first unit installed consists of four solar ponds each with a surface area of about eleven acres. The brines are concentrated to a degree where refrigeration is economically feasible. The annual output of the 4-pond unit was about 35,000 tons of "potash-nitrate" and about 15,000 tons of additional sodium nitrate. The potash-nitrate is a physical mixture of the nitrate salts of potassium and sodium, 30%-70%, respectively. The success of the first four ponds led to a decision to proceed with the construction of six more making a total of 10 ponds with an evaporating area of about 100 acres.

Briefly, the solar evaporation process is described by the Anglo-Lautaro company as follows:

1. Water added to vat and filter plant tailings as a secondary leach dissolves the water-soluble by-product values and produces a weak brine which is fed to the solar ponds and concentrates them.
2. As the brine concentrates, the more insoluble components reach their saturation point at the temperatures prevailing and deposit a crystalline sludge which settles out on the pond bottoms, leaving the other by-product values in the solution stage.
3. This sludge, comprising chiefly sodium chloride and the sulphates of sodium and magnesium in combination, is removed continuously by a suction dredge. (Plans are now underway for the erection of a processing plant to treat this sludge and recover a substantial tonnage of sodium sulphate. Recovery methods for the other chemical values are under investigation.)
4. The concentrated solution phase of the system consists chiefly of sodium nitrate, potassium nitrate, iodine and borates. By refrigeration of this concentrated pond solution, tonnages of potash nitrate and sodium nitrate are recovered.

Borate recovery is under investigation on a laboratory scale.

The dilute brine enters solar pond No. 1, evaporates to a certain degree and advancing from each pond in the system as evaporation permits it finally enters pond No. 10. By then it has become a strong, by-product solution. Refrigerating this solution causes potassium to crystallize out as a mixture of 30% potash-nitrate. The resulting mother liquor then is treated with sulfuric acid which precipitates boric acid that is recovered by filtration. The mother liquor remaining is treated further with sodium chloride which precipitates a complex iodic double salt from which pure iodine is recovered. The mother liquor from these two extractions is then led back to the solar pond system to be blended with fresh incoming brine for further concentration and a repetition of the cycle.*

During the evaporation process, large quantities of sodium chloride and a mixture of sodium sulfate-magnesium sulfate precipitate in the ponds. Accumulations are removed and stockpiled.

According to information released by Anglo-Lautaro, the solar evaporation pond development can be expanded to any size after the first economically feasible unit has been established. Expansion can then proceed by multiplying such units. One unit of ten ponds will evaporate 2,800 cubic meters of solar brine in one day. Ten of these ponds in a double row of five each will comprise conveniently one operating unit. Any other grouping may be chosen as conditions and other circumstances may dictate at any one period.

* **Acknowledgement:** The author is indebted to Dr. H. C. Brewer, Chilean Nitrate Educational Bureau, for the illustrations and authentic information on this development.

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5 Does your product cost warrant redesigning your bag to merchandise your product more effectively?
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8 Are your suppliers integrated and capable of maintaining dependable service at all times, under all conditions?
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PRODUCTION EDITION

Editorial

'Perfect' Plant Food Product? —It's Still in the Future

WHILE THE fertilizer industry has been striving successfully for years to improve its products, the "perfect" plant food has yet to be found. This is of course no reflection on existing materials but, rather, brings to mind some of the peculiarities of the trade and points up hurdles to be cleared in arriving at the stage of perfection.

Many engaged in the production of plant food have expressed wishes that they might somehow make the "ideal" material, but the exact specifications of such a product are seldom recited. However, we have seen one outline of an "ideal" product.

Travis P. Hignett of the Tennessee Valley Authority says that the following specifications were made after consultations with agronomists, fertilizer manufacturers, salesmen and farmers:

1. The ideal fertilizer should have a very high concentration of the primary plant nutrients—nitrogen, phosphoric acid, and potash.
2. It should also contain generous quantities of secondary nutrient elements including calcium, manganese and sulfur, plus at least small percentages of several other minor elements.
3. It should be in the form of hard, round particles about 0.1 inch in diameter. The material should be completely impervious to moisture until it is placed in the soil.
4. When placed in the soil, it should then go immediately into solution even if the soil is quite dry. This would make all of its nutrient content available to short-season crops. Though completely soluble, the fertilizer should not be leached from the soil nor fixed by the soil.
5. It should have a substantial residual effect extending over several years.
6. It should have an alkaline reaction on acid soils and an acid reaction on alkaline soils.
7. It should be adaptable to low-cost manufacture by unskilled labor and produced by whatever equipment, however antiquated, that the manufacturer happens to have on hand.
8. It should kill weeds and insects and condition the soil at the same time.

We hardly expect to see a rush toward making this ideal product, but it is a fact that the industry is coming closer to it all the time. Technical research has already accomplished many steps considered visionary only a few years back. It will continue to discover new methods and techniques to aid in the more efficient production of both plant foods and pesticides.

Protection of Helmets More Than a Theory Here

VISITORS at the fertilizer plant of E. Rauh Sons, Indianapolis, Ind., may wonder why protective safety hats are worn by practically everyone in the plant without any apparent urging or insistence on the part of management.

There is a good reason for this. No need is seen for bulletins, slogans, nor verbal urgings, since the men have had two classic illustrations of the worth of these helmets. In both instances, the lives of the wearers were saved.

R. D. Martenet, general manager of the plant, tells how it came about: "After we attended one of the annual fertilizer industry safety conferences in Chicago, we decided to make safety helmets available to our men in the plant," he says. "Only a few weeks after this, one of our supervisors, Burton Willis, was on the man-lift just beyond the ground floor, when a steel rod was dropped end-first, from the top of the building. It struck the upward-moving employee directly on the helmet, slashing it, but causing the rod to glance off to the side. A wrecked helmet and a stiff neck on the part of Mr. Willis were the only results. We hate to think of the consequences if no protective hat had been available," Mr. Martenet concluded.

Another incident not long after the first, involved a heavy steel hook on a crane outside the plant. Just as the operator let the hook drop, Everett Goldsberry, general foreman, came out of a door unexpectedly at precisely the right time to be struck by the heavy weight. He was knocked down and suffered a stiff neck, but no serious harm was done.

Happenings of this nature provide the best argument in the world for not only having such safety equipment in the plant, but also for making sure that these articles are used to the fullest extent by everyone.

Production Technology Conference Planned

PRODUCTION people in the fertilizer industry will be particularly interested in the pilot plant demonstrations to be sponsored by the Tennessee Valley Authority at the Muscle Shoals laboratories near Sheffield, Ala. The date of the event is set for June 9-11, just a few days before the National Plant Food Institute meeting at White Sulphur Springs, W. Va.

According to advance information issued by TVA, the pilot plant demonstration will serve to acquaint the fertilizer industry with some new developments in fertilizer production technology. Subjects to be covered include the production of liquid fertilizers, granulation of high-nitrogen and no-nitrogen grades and some factors affecting loss of nitrogen during granulation.

The agenda includes a presentation of pilot plant tests on the use of 30-10-0 fertilizer in formulating a 20-10-10 grade and granulation of no-nitrogen grades ranging from 0-14-14 to 0-30-30. The pilot plant will be operated to produce a grade of 0-25-25 using the phosphoric acid-phosphate rock reaction to supply heat for granulation.

A conference on liquid fertilizers is also on the program. This will take up the technology of manufacturing liquid mixed fertilizers, as well as agronomic and application phases of the subject. A number of new developments in the liquid fertilizer field will be described and demonstrated, including the use of superphosphoric acid and wet-process phosphoric acid in manufacture of the liquids.

Looks like an interesting and meaty conference. If you plan to attend, notify J. H. Walthall, director of chemical development, TVA, Wilson Dam, Ala.

Croplife's Home Office

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PRODUCTION EDITION

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CROPLIFE is a controlled circulation journal published weekly. Weekly distribution of each issue is made to the fertilizer manufacturers, pesticide formulators and basic chemical manufacturers. In addition, the dealer-distributor-farm adviser segment of the agricultural chemical industry is covered on a regional (crop area) basis with a mailing schedule which covers consecutively, one each week, three geographic regions (South, Midwest and West) of the U.S. On the fourth week, production personnel in fertilizer manufacturing and pesticide formulating plants throughout the U.S. are covered in depth. To those not eligible for this controlled distribution, Croplife's subscription rate is $5 for one year ($8 a year outside the U.S.). Single copy price 25¢.

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Associated Publications—The Northwestern Miller, The American Baker, Farm Store Merchandising, Feedstuffs, Milling Production.

Industry Meetings

CALENDAR FOR 1959-60

APRIL

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April 29-30—Symposium on transportation, regulation and packaging of chemical products, sponsored by Manufacturing Chemists Assn., Engineering and Scientific Center, Cleveland, Ohio.

May 21—Chemical industry safety workshop, sponsored by Manufacturing Chemists' Assn., Palmer House, Chicago.

June 4—Executive Committee meeting, Fertilizer Section, National Safety Council, Roanoke Hotel, Roanoke, Va.

June 9-10—Seventeenth Annual Convention of the Association of Southern Feed and Fertilizer Control Officials, Velda Rose Motel, Hot Springs, Ark.; Maurice Rowe, Virginia Department of Agriculture, 1122 State Office Bldg., Richmond 19, Va.

June 9-11—Pilot plant demonstration on recent developments in fertilizer production technology. Muscle Shoals laboratories, Muscle Shoals, Ala.

June 11-13—Manufacturing Chemists' Assn., The Greenbrier Hotel, White Sulphur Springs, W. Va.

June 14-17—National Plant Food Institute, Annual Convention, the Greenbrier, White Sulphur Springs, W. Va.

July 7-9 — Pacific Northwest Plant Food Assn., 10th Annual Regional Fertilizer Conference, Tacoma, Wash.

Oct. 21-23—National Agricultural Chemicals Assn. 26th annual meeting, French Lick-Sheraton Hotel, French Lick, Ind.

Nov. 4-6—Fertilizer Industry Round Table, Mayflower Hotel, Washington, D.C.; Dr. Vincent Sauchelli, National Plant Food Institute, chairman.

Croplife

PRODUCTION EDITIONS

Appear every fourth week. Watch for your next copy on

MAY 11

Helpful articles on:

- Pesticide Formulation
- Corrosion Problems
- Economics of Bagging
- Outstanding fertilizer and pesticide plants
- Safety
- Fertilizer Manufacture

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Classified advertisements accepted until Tuesday each week for the issue of the following Monday.

Rates: 15c per word; minimum charge $2.25. Situations wanted, 10c a word; $1.50 minimum. Count six words of signature, whether for direct reply or keyed care this office. If advertisement is keyed, care of this office, 20c per insertion additional charged for forwarding replies. Commercial advertising not accepted in classified advertising department. Advertisements of new machinery, products and services accepted for insertion at minimum rate of $10 per column inch.

All Want Ads cash with order.

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SALES MANAGER — FERTILIZER OR seed experience—East Coast location. Aggressive, growing organization wants man capable of selling at garden centers to distributor levels. Tremendous opportunity for permanent future. Our employees are stockholders. Send background resume to Ad No. 4669, Croplife, Minneapolis 40, Minn.

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FOR SALE—FERTILIZER PLANT, GOOD Iowa location. Granulation equipment. Sell on contract. Write P. O. Box 662, Sioux City, Iowa.

MISCELLANEOUS

BRUSH AND WEED KILLER

KILL SUBMERSED water weeds which foul up motor propellers, tangle fishing gear and choke irrigation ditches with R-H Granular Weed Rhap. Inexpensive, easy to use, sure results. For details write Reasor-Hill Corporation, Box 36CL, Jacksonville, Ark.

KILL BRUSH at low cost with amazing R-H Brush Rhap. Will not injure grasses, grains, cattle, or other animals. See your dealer, or write Reasor-Hill Corporation, Box 36CL, Jacksonville, Ark.

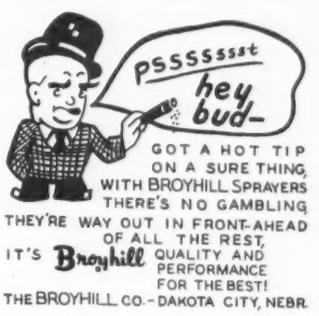
Croplife *Want Ads . . . Get Results*

New Plant Planned

ALBUQUERQUE, N. M. — Plans have been announced by Ravel Brothers for a $250,000 fertilizer and feed manufacturing plant to be built on Broadway S.E.

Manager Named

EUGENE, ORE.—Ken Farrens has been named manager of the Eugene Farmers Cooperative, according to Paul N. Frantz, manager of the Co-op. The facility will have a 60,000 gallon capacity to handle liquids.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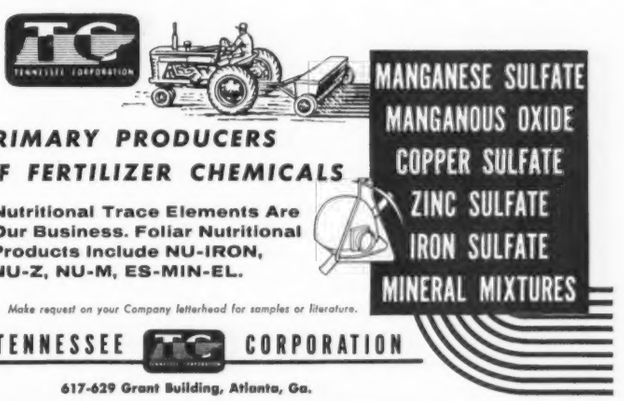
hey bud-
GOT A HOT TIP ON A SURE THING, WITH BROYHILL SPRAYERS THERE'S NO GAMBLING
THEY'RE WAY OUT IN FRONT-AHEAD OF ALL THE REST, IT'S Broyhill QUALITY AND PERFORMANCE FOR THE BEST!
THE BROYHILL CO. - DAKOTA CITY, NEBR.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Nutritional Trace Elements Are Our Business. Foliar Nutritional Products Include NU-IRON, NU-Z, NU-M, ES-MIN-EL.
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ZINC SULFATE
IRON SULFATE
MINERAL MIXTURES
Make request on your Company letterhead for samples or literature.
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617-629 Grant Building, Atlanta, Ga.

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BULK CONVEYORS
FOR FERTILIZER, SAND, GRAVEL, GRAIN OR ANY BULK MATERIALS, HERE IS A CONVEYOR THAT BEARS INVESTIGATION. DUAL PURPOSE TOO, THEY CAN ALSO BE USED FOR SACKS.
ELTON PRODUCTS
CHANTLAND MFG. CO.
HUMBOLDT, IOWA
WRITE FOR A CATALOG, IT DESCRIBES THESE MACHINES AND ALL THE OTHERS IN THE ELTON LINE.

"Our new H-25 PAYLOADER® increases overall plant efficiency"*

* **That's how Ralph J. Puetz, Plant Supt. of Senesac Fertilizer, Inc., Fowler, Indiana sums up the benefits of the H-25's "larger bucket capacity, power-shift transmission and other operating features".** At the same time, he also adds a good word for their 4-year old model HA which "has worked continuously, giving very good service with no repairs except normal maintenance".

If you want to get more production per tractor-shovel and per operator, the Model H-25 "PAYLOADER" merits your consideration.

BUILT FOR PRODUCTION — On several occasions Senesac's Model H-25 has unloaded 50-ton rail cars of bulk material in one hour. With its 2,500 lb. carry capacity — 25 to 50% more than has been heretofore available in a 6-foot-turning radius unit — the H-25 can carry more per trip. Because of its power-steer and power-shift transmission with 2 speed ranges forward *and* reverse, it handles with finger-tip ease and cycles faster to make more trips. The more-powerful bucket break-out action, and more-positive traction provided by power-transfer differential get big loads easier out of hardened stockpiles.

BUILT-IN PROTECTION — It has extraordinary protection against dust and dirt damage: triple air cleaners — precleaner and two oil-bath air cleaners; cartridge-type oil filters on the three oil systems; sealed self-adjusting hydraulic service brakes; parking brake enclosed in transmission; special oil and grease seals on all vital points.

For bigger loads, for faster, easier operation — for more production per shift at lower net cost per ton, get an H-25 demonstration from your Hough Distributor. Ask him about Hough Purchase and Lease Plans, too.

THE FRANK G. HOUGH CO.
970 Sunnyside Ave., Libertyville, Ill.

☐ Send data on new H-25 "PAYLOADER"
☐ On Other "PAYLOADER" models

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Title.....

Company.....

Street.....

City.....State.....

4-A-1

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SUBSIDIARY — INTERNATIONAL HARVESTER COMPANY